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**Empirical Bayes
Shrinkage Estimates
of State Food Stamp
Participation Rates
for 1994-1998**

Final Report

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EXECUTIVE SUMMARY

The Food Stamp Program is a central component of American policy to reduce hunger and poverty. The program's main purpose is "to permit low-income households to obtain a more nutritious diet . . . by increasing their purchasing power" (Food Stamp Act of 1977, as amended). The Food Stamp Program is the largest of the domestic food and nutrition assistance programs administered by the U.S. Department of Agriculture's Food and Nutrition Service. During fiscal year 2000, the program served just over 17 million people in an average month at a total annual cost of nearly \$15 billion in benefits. The average monthly food stamp benefit was about \$170 per household.

This report presents estimates that, for each state, measure the need for the Food Stamp Program and the program's effectiveness in each of the five years from 1994 to 1998. The estimated numbers of people eligible for food stamps measure the need for the program. The estimated food stamp participation rates measure, state by state, the program's performance in reaching its target population.

The estimates presented in this report were derived using empirical Bayes shrinkage estimation methods and data from the Current Population Survey, the decennial census, and administrative records. The shrinkage estimator that was used averaged sample estimates of participation rates in each state with predictions from a regression model. The predictions were based on observed indicators of socioeconomic conditions in the states, such as per capita income and the percentage of the total state population receiving food stamps. The shrinkage estimates derived are substantially more precise than direct sample estimates from the Current Population Survey or the Survey of Income and Program Participation, the best sources of current data on household incomes and program eligibility. Shrinkage estimators improve precision by "borrowing strength," that is, by using data for several years from all the states to derive each state's estimate for a given year and by using not only sample survey data but also census and administrative data. This report describes our shrinkage estimator in detail.

I. INTRODUCTION

This report presents estimates of the food stamp participation rate and the number of people eligible for food stamps in each state for the years 1994 to 1998. These estimates were derived using “shrinkage” estimation methods. This introductory chapter overviews the advantages and some previous applications of shrinkage estimation. Chapter II describes how we derived shrinkage estimates, and Chapter III presents our state estimates. Technical details and additional information about our estimation methods are provided in the Appendix. The estimates presented here are also reported and compared with one another in Schirm (2001).

The principal challenge in deriving state estimates like those presented in this report is that the leading national surveys collecting current income data for families—the Current Population Survey (CPS) and the Survey of Income and Program Participation (SIPP)—have small samples for most states. Thus, “direct” estimates from these surveys are imprecise. For example, because of the potential errors introduced by the CPS surveying only a small number of families in Kansas rather than all families in the state, we can be confident—by a commonly used standard—only that Kansas’ food stamp participation rate in 1998 was between about 39 and 63 percent. This range is wide (but typical), reflecting our substantial uncertainty about what Kansas’ participation rate actually was.

Why small samples make direct estimates imprecise is easy to see. By the definition of “direct,” a direct estimate is based on data from one source for the state and time period in question. Thus, a 1998 estimate for Kansas would be calculated using just 1998 data on households in one sample from Kansas. If 1998 data are collected for only a small number of Kansas households, as in the CPS or SIPP, a direct estimate will be imprecise, that is, subject to substantial sampling error because the estimator uses only the information contained in the small

sample. Therefore, as illustrated before, estimates of participation rates will have large standard errors and wide confidence intervals, reflecting a lot of uncertainty about the true rate of participation.

To improve precision, statisticians have developed “indirect” estimators. These estimators “borrow strength” by using data from other states, time periods, or data sources. The assumption underlying indirect estimation is that what happened in other states in 1998 or what happened in Kansas (and other states) in other years is relevant to estimating what happened in Kansas in 1998. In an application of indirect estimation, the Census Bureau has improved the precision of state poverty rates from the CPS by calculating two- and three-year averages (Dalaker and Proctor 2000).

A generally superior indirect estimator is the so-called “shrinkage” estimator. A shrinkage estimator averages estimates obtained from different methods. For example, Fay and Herriott (1979) developed a shrinkage estimator that combined direct sample and regression estimates of per capita income for small places (population less than 1,000). Their estimates were used to allocate funds under the General Revenue Sharing Program. Shrinkage estimators have also been used to develop state estimates of income-eligible infants and children for allocating funds under the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (Schirm 2000). To borrow strength across both space (states) and time, the current generation WIC eligibles estimator uses several years of CPS data and combines direct sample estimates with predictions from a regression model. The predictions of WIC eligibles are based on, for example, state poverty rates and mean adjusted gross incomes according to tax return data. States with similar socioeconomic conditions, as reflected in these poverty rate and mean income statistics, are observed (and predicted) to have similar proportions of infants and children eligible for WIC. This contrasts with the direct estimator that ignores systematic patterns across states,

using, for example, only Kansas data to derive an estimate for Kansas, even though conditions may be similar in Nebraska or Oklahoma. The shrinkage estimator uses data for all the states (with data for prior years and data from other sources) to estimate a regression model and formulate a prediction for Kansas. Then, the shrinkage estimator optimally averages the direct sample and regression estimates for Kansas to obtain a shrinkage estimate. In another application of shrinkage methods, shrinkage estimates of poor school-aged children by state and county are used in allocating Title I compensatory education funds for disadvantaged youth (National Research Council 2000).

In these and other applications of shrinkage estimation, the gain in precision from borrowing strength via a shrinkage estimator can be substantial. The confidence intervals for the shrinkage estimates of WIC eligibles in 1992 were, on average, 61 percent narrower than the corresponding direct sample confidence intervals (Schirm 1995). To obtain that same gain in precision with a direct estimator would require—according to rough calculations—more than a six-fold increase in sample size, an option that is surely not available to us. Therefore, we must use an indirect estimator and borrow strength (while recognizing that the gain in precision will often not be quite as large as for the 1992 WIC estimates).

As noted before, we have used a shrinkage estimator to derive state estimates of food stamp participation rates and counts of eligible people. The estimator combined direct sample and regression estimates and borrowed strength across states and over time. Like the estimators used in the other applications described in this chapter, our estimator also borrowed strength by using data from outside the main sample survey (the CPS), specifically, data from administrative records systems and the decennial census. In all, our estimator used one year of census data, five years of CPS data, and five years of Food Stamp Program, income tax, and other administrative data for all the states to obtain estimates for each state in each year (1994 to 1998).

Although the shrinkage estimates derived for any one application are not guaranteed to be more accurate than estimates obtained using some other method, shrinkage estimators have good statistical properties in general, and we have found for our specific application that as in previous applications, shrinkage estimation can greatly improve precision. Additional support for shrinkage estimators is provided by the findings from simulation studies. For example, in a comprehensive evaluation of the relative accuracy of alternative estimators of state poverty rates, Schirm (1994) found that shrinkage estimates are substantially more accurate than direct estimates or indirect estimates obtained from other methods that have been widely used.

II. A STEP-BY-STEP GUIDE TO DERIVING STATE ESTIMATES

This chapter describes our procedure for estimating state food stamp participation rates and numbers of people eligible for food stamps. This procedure, summarized by the flow chart in Figure II.1, has the following four steps:

1. From Current Population Survey (CPS) data and Food Stamp Program (FSP) administrative data, derive direct sample estimates of state food stamp participation rates for September in each of the five years 1994 to 1998.
2. Using a regression model, predict state food stamp participation rates based on administrative and decennial census data.
3. Using “shrinkage” methods, average the direct sample estimates and regression predictions to obtain preliminary shrinkage estimates of state food stamp participation rates.
4. Adjust the preliminary shrinkage estimates to obtain final shrinkage estimates of state food stamp participation rates.

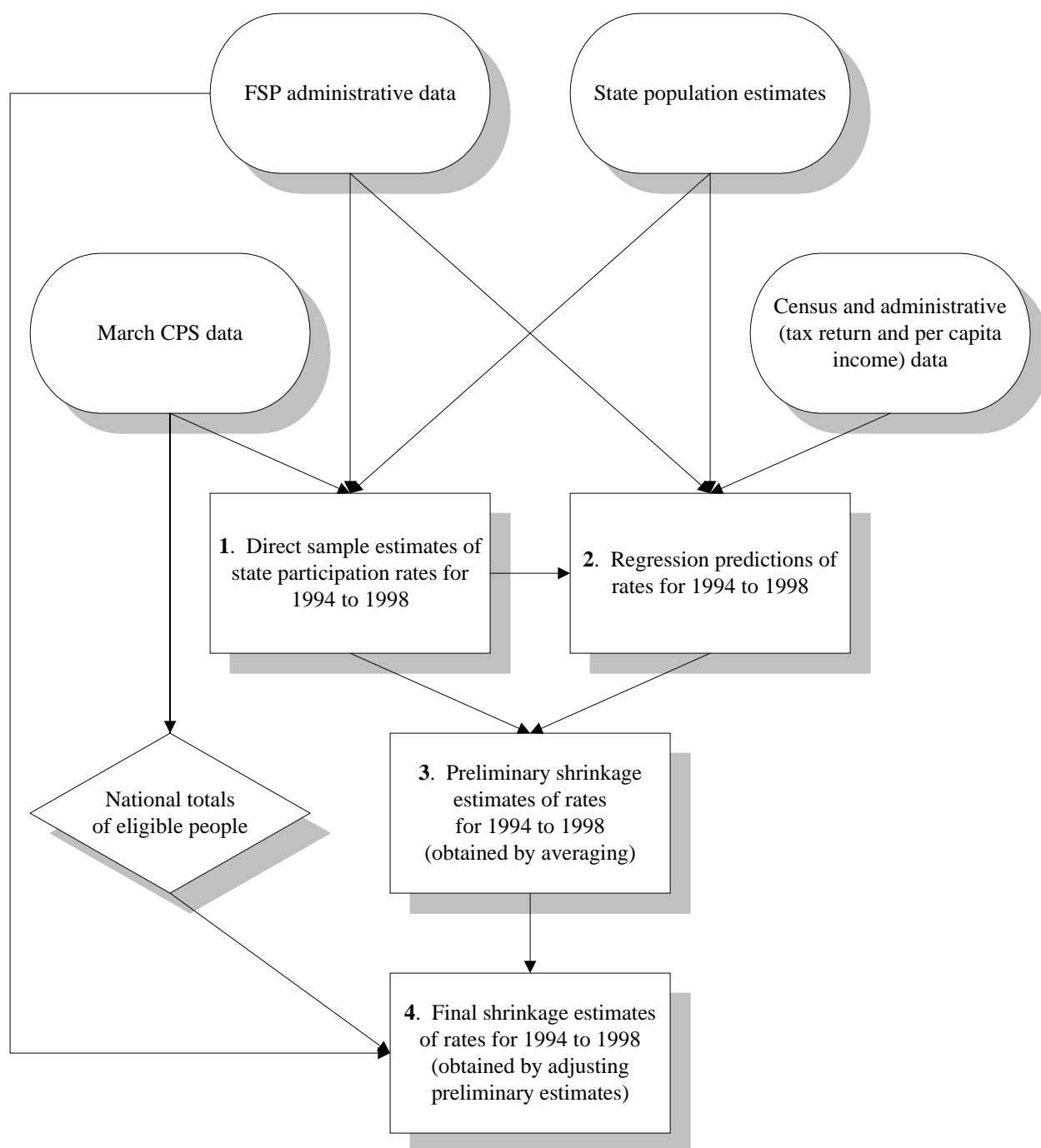
Each step is described in the remainder of this chapter, and additional technical details are provided in the Appendix.

1. From CPS data and FSP administrative data, derive direct sample estimates of state food stamp participation rates for September in each of the five years 1994 to 1998.

A food stamp participation rate is obtained by dividing an estimate of the number of people receiving food stamps by an estimate of the number of people eligible for food stamps, with the resulting ratio expressed as a percentage. We used FSP administrative data to estimate numbers of recipients. To derive direct sample estimates of participation rates, we used CPS data to estimate numbers of eligibles. Because the CPS collects family income data for the prior calendar year, we obtained estimates of eligibles in 1998, for example, from the March 1999 CPS.

FIGURE II.1

THE ESTIMATION PROCEDURE



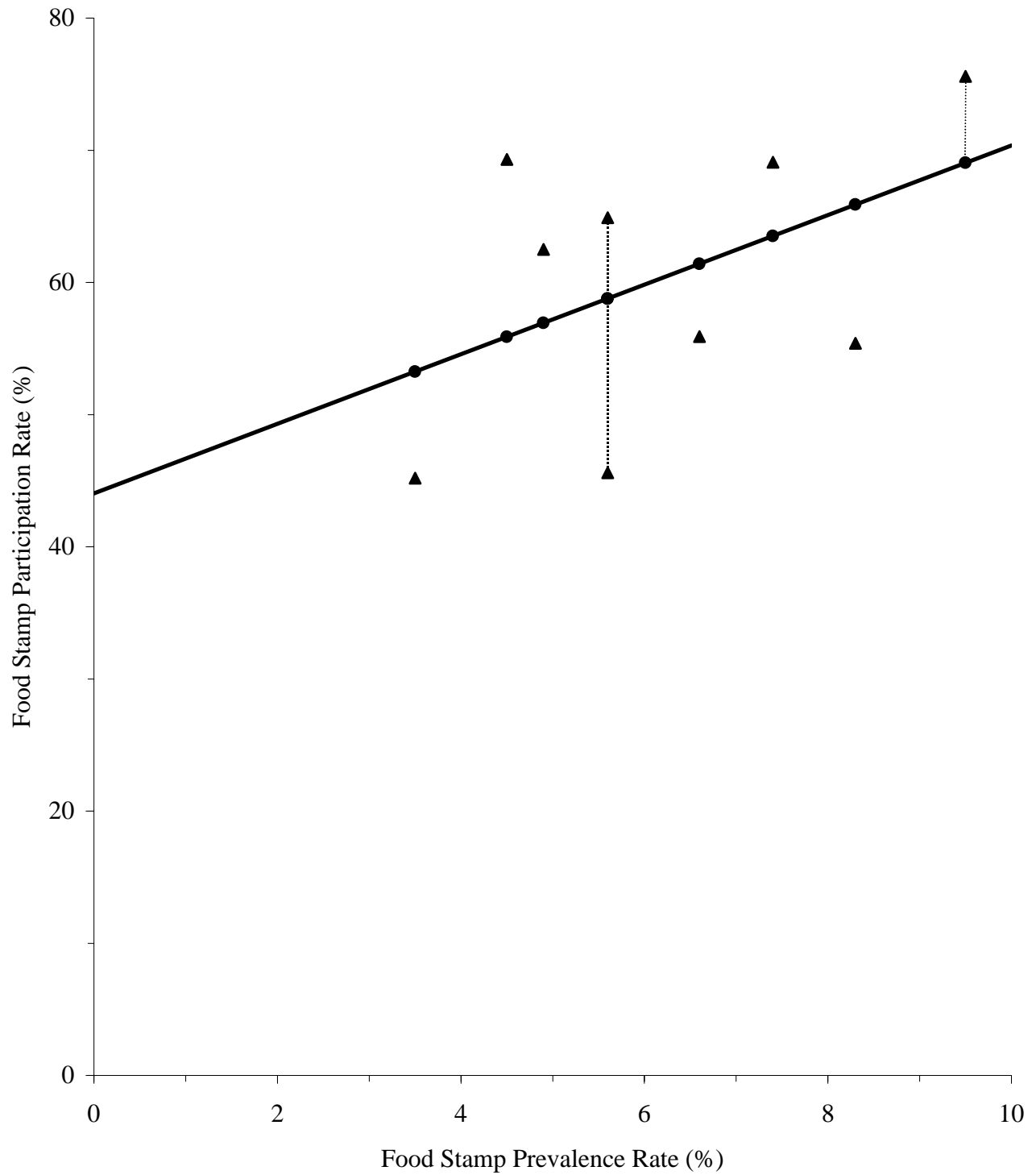
As noted in Chapter I, direct sample estimates of participation rates are relatively imprecise. The standard errors for the estimates, reported in the Appendix along with the estimated rates, tend to be large, so our uncertainty about states' true rates is great. For example, according to commonly used statistical standards, we can be confident only that Kansas' participation rate in 1998 was between 39 percent and 63 percent. This range is so wide and our uncertainty so great because the CPS sample for Kansas is small. This lack of data, that is, the small number of sample observations that pertain directly to the target geographic area and time period—Kansas and 1998 in our example—is the fundamental problem of “small area estimation.”

2. Using a regression model, predict state food stamp participation rates based on administrative and decennial census data.

The main limitation of the sample estimates derived in the previous step is imprecision. Regression can reduce that imprecision. Regression estimates are predictions based on nonsample or highly precise sample data, such as census and administrative records data. The latter include records from government tax and transfer programs.

Figure II.2 illustrates how the regression estimator works. The simple example in the figure has only nine states and data for just one year on one predictor—the food stamp “prevalence” rate—that will be used to predict each state's food stamp participation rate. The food stamp prevalence rate is measured by the percentage of all people (eligible and ineligible combined) who receive food stamps, in contrast to the food stamp participation rate, which is measured by the percentage of eligible people who receive food stamps. The triangles in the figure correspond to direct sample estimates; a triangle shows the prevalence rate in a state (read off the horizontal axis) and the sample estimate of the participation rate in that state (read off the vertical axis). Not surprisingly, the graph suggests that prevalence and participation rates are systematically associated. States with higher percentages of all people participating in the FSP

FIGURE II.2
AN ILLUSTRATIVE REGRESSION ESTIMATOR



tend to have higher percentages of eligible people participating, although the relationship is far from perfect. To measure this relationship between prevalence and participation rates and derive predictions, we can use a technique called “least squares regression” to draw a line through the triangles (that is, we “regress” the sample estimates on the predictor). Regression estimates of participation rates are points on that line, the circles in Figure II.2. The predicted participation rate for a particular state is obtained by moving up or down from the state’s sample estimate (the triangle) to the regression line (where there is a circle) and reading the value off the vertical axis. For example, the regression estimator predicts a participation rate of just under 60 percent for both states with prevalence rates of about 5.5 percent. In contrast, for the state with about 9.5 percent of people receiving food stamps, the predicted participation rate is nearly 70 percent.

To derive the regression estimates for 1994 to 1998 presented in the Appendix (in Table A.14), we included all of the states, not just nine as in our illustrative example, and we used seven predictors, not just one. Adding six predictors improves our predictions. The seven predictors used measure:

- the percentage of the population receiving food stamps, that is, the food stamp prevalence rate
- the child poverty rate according to individual income tax data, namely, the percentage of child exemptions that are claimed on tax returns with income below the federal poverty level
- the tax return nonfiler rate for elderly people, that is, the percentage of the elderly population that is not claimed as exemptions on tax returns
- per capita income
- the percentage of people at or below 130 percent of the federal poverty level in 1989 according to the 1990 Decennial Census
- the percentage of adults who are noncitizens according to the 1990 Decennial Census
- a dummy variable equal to one for the Mountain Plains Region (and zero for other regions)

The first four predictors are obtained primarily or entirely from administrative data, and the fifth and sixth predictors are from the 1990 Decennial Census. The seventh predictor is based on the regional assignments that were established for administering federal nutrition programs. These seven predictors were selected as the best from a longer list described in the Appendix, which also provides complete definitions and sources for the predictors. The Appendix also presents standard errors for the regression estimates. These tend to be fairly equal across the states and much smaller than the largest standard errors for sample estimates, reflecting substantial gains in precision from regression for the states with the most error-prone sample estimates.

Comparing how the direct sample and regression estimators use data reveals how the regression estimator “borrows strength” to improve precision. When we derived sample estimates in Step 1, we used only one year’s CPS sample data from Kansas to estimate Kansas’ participation rate in that year, even though Kansas, like nearly all states, has a small CPS sample. Deriving regression estimates in this step, we estimated a regression line from sample, administrative, and census data for several years and all the states and used the estimated line (with administrative and census data for Kansas) to predict Kansas’ participation rate in a given year. In other words, the regression estimator not only uses the sample estimates from every state for several years to develop a regression estimate for a single state in a single year but also incorporates data from outside the sample, namely, data in administrative records systems and the census.

The regression estimator improves precision by using more data. It uses that additional data to identify states with sample estimates that seem too high or too low because of sampling error, that is, error from drawing a sample—a subset of the population—that has a higher or lower participation rate than the entire state population has. For example, suppose a state has a low

food stamp prevalence rate and values for other predictors that are consistent with a low food stamp participation rate. Then, our regression estimator would predict a low participation rate for that state, implying that a sample estimate showing a high rate is too high. The regression estimate will be lower than the sample estimate for such a state. On the other hand, if the sample data for a state show a much lower participation rate than expected in light of the food stamp prevalence rate and the other predictors, the regression estimate for that state will be higher than the sample estimate.

3. Using “shrinkage” methods, average the direct sample estimates and regression predictions to obtain preliminary shrinkage estimates of state food stamp participation rates.

As noted before, the limitation of the direct sample estimator is imprecision. The limitation of the regression estimator is called “bias.” Some states really have higher or lower participation rates than we expect (and predict with the regression estimator) based on the food stamp prevalence rate and other predictors used. Such errors in regression estimates reflect bias.

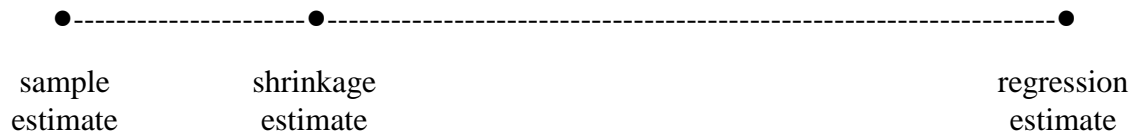
These limitations arise for the following reasons. The sample estimator uses relatively little information. It uses only the typically small number of sample observations for one state and one year to obtain an estimate for that state and year. It does not use sample data for other states or other years or data from other sources, such as administrative records or the census. Although the regression estimator borrows strength, using data from all the states and several years as well as administrative and census data, it makes no further use of the sample data after estimating the regression line. It treats the entire difference between the sample and regression estimates as sampling error, that is, error in the sample estimate. No allowance is made for prediction error, that is, error in the regression estimate. Although not all, if any, true state participation rates lie on the regression line, the assumption underlying the regression estimator is that they do.

Using all of the information at hand, a shrinkage estimator addresses the limitations of the sample and regression estimators by combining the sample and regression estimates, striking a compromise. As illustrated in Figure II.3, a shrinkage estimator takes a weighted average of the sample and regression estimates, weighting them according to their relative accuracy. We calculated weights using the empirical Bayes methods described in the Appendix. Generally, the more precise the sample estimate for a state, the closer the shrinkage estimate will be to it. The larger samples drawn in large states support more precise sample estimates, so shrinkage estimates tend to be closer to the sample estimates for large states. Given the precision of the sample estimate for a state, the weight given to the regression estimate depends on how well the regression line “fits.” If we find good predictors reflecting why some states have higher participation rates than other states, we say that the regression line “fits well.” The shrinkage estimate will be closer to the regression estimate and farther from the sample estimate when the regression line fits well than when the line fits poorly. Striking a compromise between the sample and regression estimators, the shrinkage estimator strikes a compromise between imprecision and bias. The sample and regression estimates are optimally weighted to improve accuracy by minimizing a measure of error that reflects both imprecision and bias. By accepting a little bias, the shrinkage estimator may be substantially more precise than the sample estimator. By sacrificing a little precision, the shrinkage estimator may be substantially less biased than the regression estimator. The shrinkage estimator optimizes the tradeoff between imprecision and bias.

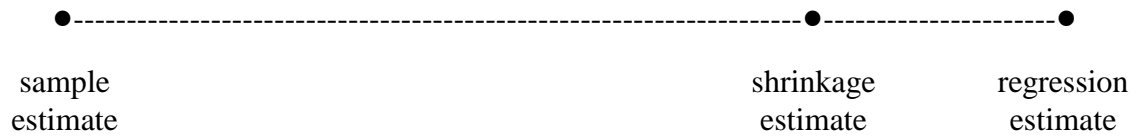
In the next step of our estimation procedure, we make some fairly small adjustments to the shrinkage estimates that we derive in this step. Thus, we call the estimates from this step “preliminary” and the estimates from the next step “final.”

FIGURE II.3
SHRINKAGE ESTIMATION

Poor predictions or state with relatively large sample \Rightarrow more weight on sample estimate:



Good predictions or state with relatively small sample \Rightarrow more weight on regression estimate:



4. Adjust the preliminary shrinkage estimates to obtain final shrinkage estimates of state food stamp participation rates.

We adjusted the preliminary shrinkage estimates of participation rates in two ways. First, we adjusted the rates so that the eligibles counts implied by the rates sum to the national eligibles count estimated directly from the CPS. Second, we adjusted the rates so that no state's estimated rate is greater than 100 percent. These adjustments were carried out for each year separately. The following description of the adjustments will focus on the 1998 estimates. We describe the results of the adjustments for other years and discuss our adjustment methods in more detail in the Appendix.

To implement the first adjustment, we calculated preliminary estimates of eligibles counts from the preliminary estimates of participation rates derived in Step 3 and the administrative estimates of the numbers of food stamp recipients obtained in Step 1. The state eligibles counts summed to 31,752,376 for 1998, while the national total for 1998 estimated directly from the CPS was 30,586,224. To obtain estimated eligibles counts for states that sum (aside from rounding error) to the direct estimate of the national total, we multiplied each of the preliminary eligibles counts by $30,586,224 \div 31,752,376$ (≈ 0.9633). Such benchmarking of estimates for smaller areas to a relatively precise estimated total for a larger area is common practice.

After carrying out this first adjustment for 1998, one state had fewer estimated eligibles than participants, implying a participation rate over 100 percent. To cap participation rates at 100 percent, we performed a second adjustment. Specifically, we took eligibles away from the 50 states that had enough eligibles (that is, more eligibles than participants) and gave them to the state that did not have enough, stopping when the number of eligibles in that state equaled the number of participants. Eligibles were taken away from states in proportion to their numbers of eligibles. This adjustment, which moved very small numbers of eligibles among states, did not change the national total. Moreover, except for the state with a participation rate initially over

100 percent, this adjustment did not change any state's participation rate by more than two-hundredths of a percentage point.

After completing these adjustments, we had obtained our final shrinkage estimates of the numbers of people eligible for food stamps. From those estimates and our administrative estimates of the numbers of food stamp recipients, we derived final shrinkage estimates of participation rates. Our final shrinkage estimates are presented in the next chapter.

III. STATE ESTIMATES OF FSP PARTICIPATION RATES AND NUMBERS OF ELIGIBLE PEOPLE FOR 1994 TO 1998

Table III.1 presents our final shrinkage estimates of September food stamp participation rates in each state for 1994 to 1998. For those same years, Table III.2 displays our final shrinkage estimates of the number of people eligible for food stamps in September in each state.

These shrinkage estimates are relatively precise; they have much smaller standard errors and narrower confidence intervals than the CPS direct sample estimates. Tables III.3 to III.7 display approximate 90-percent confidence intervals showing the uncertainty remaining after using shrinkage estimation. One interpretation of such an interval is that there is a 90 percent chance that the true value—that is, the true participation rate or the true number of eligible people—falls within the estimated bounds. For example, while our best estimate is that Kansas' participation rate was 53 percent in 1998 (see Table III.1), the true rate may have been higher or lower. However, according to Table III.7, the chances are 90 in 100 that the true rate was between 46 and 60 percent, an interval that is about three-fifths as wide as the interval (cited in Chapter I) around the direct sample estimate. A narrower interval means that we are less uncertain about the true value. According to our calculations, a shrinkage confidence interval for a participation rate is, on average, only about 58 percent as wide as the corresponding sample confidence interval. Thus, shrinkage substantially improves precision and reduces our uncertainty. Despite the impressive gains in precision, however, substantial uncertainty about the true participation rates for some states remains even after the application of shrinkage methods. Nevertheless, as discussed in Schirm (2001), the shrinkage estimates are sufficiently precise to show, for example, whether a state's food stamp participation rate was probably near the top, near the bottom, or in the middle of the distribution of rates in a given

year. That would be enough information for many important purposes, such as guiding an initiative to improve program performance.

TABLE III.1
FINAL SHRINKAGE ESTIMATES OF SEPTEMBER FOOD STAMP PARTICIPATION RATES
(Percent)

	1994	1995	1996	1997	1998
Alabama	70	62	67	62	63
Alaska	72	77	78	83	80
Arizona	75	63	59	56	47
Arkansas	65	52	60	54	64
California	58	61	61	62	54
Colorado	70	62	59	56	52
Connecticut	67	72	61	61	60
Delaware	74	73	67	68	56
District of Columbia	65	71	67	83	89
Florida	67	60	60	56	54
Georgia	75	72	65	58	57
Hawaii	84	100	89	100	100
Idaho	57	55	58	51	49
Illinois	73	75	69	74	66
Indiana	74	72	68	65	61
Iowa	72	68	64	64	57
Kansas	64	65	63	59	53
Kentucky	76	77	72	71	69
Louisiana	76	70	69	67	69
Maine	89	91	84	85	82
Maryland	72	76	67	68	66
Massachusetts	67	63	61	49	49
Michigan	78	80	73	74	70
Minnesota	69	70	66	59	56
Mississippi	81	72	73	68	57
Missouri	83	80	73	66	66
Montana	67	56	55	62	59
Nebraska	72	65	60	68	65
Nevada	58	57	57	47	46
New Hampshire	67	71	64	53	45
New Jersey	66	75	65	60	58
New Mexico	72	63	62	64	66
New York	73	74	68	65	60
North Carolina	63	61	65	58	50
North Dakota	63	59	60	60	54
Ohio	80	80	69	70	58
Oklahoma	68	63	58	82	61
Oregon	70	73	66	70	63
Pennsylvania	81	82	74	74	69
Rhode Island	77	82	74	68	70
South Carolina	69	54	64	63	64
South Dakota	59	51	56	58	57
Tennessee	83	75	70	69	69
Texas	72	71	64	57	51
Utah	75	73	72	65	60
Vermont	88	88	77	84	68
Virginia	75	73	66	57	59
Washington	74	79	71	68	64
West Virginia	91	94	89	100	92
Wisconsin	68	66	60	54	49
Wyoming	69	63	63	56	54
United States	71	70	66	64	59

TABLE III.2

FINAL SHRINKAGE ESTIMATES OF NUMBERS OF PEOPLE ELIGIBLE FOR FOOD STAMPS IN SEPTEMBER
(Thousands)

	1994	1995	1996	1997	1998
Alabama	740	786	729	691	640
Alaska	62	57	60	50	51
Arizona	643	659	688	579	563
Arkansas	417	506	450	470	390
California	5,318	5,100	4,879	3,853	3,795
Colorado	360	378	383	344	337
Connecticut	328	307	348	331	302
Delaware	76	73	85	69	71
District of Columbia	140	131	136	106	93
Florida	2,088	2,221	2,171	1,797	1,703
Georgia	1,080	1,092	1,145	1,069	1,006
Hawaii	140	127	146	121	121
Idaho	128	135	126	121	109
Illinois	1,580	1,457	1,520	1,279	1,263
Indiana	636	522	523	499	482
Iowa	254	254	260	227	216
Kansas	284	268	255	216	210
Kentucky	666	658	645	583	564
Louisiana	957	971	907	791	756
Maine	145	137	150	133	128
Maryland	536	491	520	483	437
Massachusetts	640	614	593	608	543
Michigan	1,258	1,158	1,187	1,034	995
Minnesota	435	419	412	388	370
Mississippi	586	626	568	522	528
Missouri	679	667	698	613	595
Montana	100	118	118	96	99
Nebraska	143	150	159	134	140
Nevada	159	167	156	152	139
New Hampshire	85	72	74	75	75
New Jersey	818	701	784	726	678
New Mexico	317	364	357	274	260
New York	2,910	2,861	2,962	2,584	2,513
North Carolina	958	984	920	933	966
North Dakota	64	64	63	54	59
Ohio	1,452	1,299	1,324	1,135	1,137
Oklahoma	535	556	558	469	451
Oregon	379	368	390	310	328
Pennsylvania	1,429	1,358	1,386	1,258	1,201
Rhode Island	119	111	116	114	102
South Carolina	537	638	549	525	495
South Dakota	85	95	85	77	75
Tennessee	853	827	877	774	733
Texas	3,548	3,438	3,426	3,119	2,892
Utah	161	149	141	143	145
Vermont	71	63	67	57	52
Virginia	685	708	758	722	619
Washington	610	568	598	494	484
West Virginia	318	305	317	268	264
Wisconsin	478	451	419	378	367
Wyoming	47	49	51	43	42
United States	37,037	36,279	36,239	31,892	30,586

TABLE III.3

APPROXIMATE 90-PERCENT CONFIDENCE INTERVALS FOR FINAL SHRINKAGE ESTIMATES FOR SEPTEMBER 1994

	Participation Rate (Percent)		Number of Eligible People (Thousands)	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Alabama	64	77	669	810
Alaska	62	81	54	70
Arizona	68	81	586	699
Arkansas	59	70	382	452
California	55	60	5,110	5,526
Colorado	62	78	318	401
Connecticut	58	75	287	369
Delaware	66	82	67	85
District of Columbia	55	75	118	161
Florida	61	73	1,901	2,276
Georgia	70	81	998	1,162
Hawaii	74	93	125	156
Idaho	50	64	113	143
Illinois	67	78	1,457	1,704
Indiana	67	81	576	696
Iowa	64	80	225	282
Kansas	58	70	259	309
Kentucky	69	83	603	730
Louisiana	70	83	872	1,042
Maine	81	97	132	159
Maryland	64	79	482	590
Massachusetts	61	73	582	697
Michigan	73	83	1,176	1,341
Minnesota	61	76	388	483
Mississippi	73	89	527	646
Missouri	73	93	601	758
Montana	59	75	88	111
Nebraska	64	79	128	159
Nevada	52	65	141	178
New Hampshire	59	74	75	94
New Jersey	60	71	747	888
New Mexico	68	76	297	336
New York	69	78	2,737	3,084
North Carolina	58	68	884	1,033
North Dakota	57	70	57	71
Ohio	74	85	1,352	1,552
Oklahoma	63	74	492	578
Oregon	63	77	343	416
Pennsylvania	75	86	1,328	1,530
Rhode Island	69	85	107	131
South Carolina	62	76	483	591
South Dakota	50	68	72	98
Tennessee	77	89	792	913
Texas	68	75	3,374	3,721
Utah	66	83	142	179
Vermont	80	97	64	78
Virginia	70	80	638	731
Washington	68	79	565	655
West Virginia	84	99	292	344
Wisconsin	61	75	427	529
Wyoming	61	76	42	52
United States	70	72	36,349	37,725

TABLE III.4

APPROXIMATE 90-PERCENT CONFIDENCE INTERVALS FOR FINAL SHRINKAGE ESTIMATES FOR SEPTEMBER 1995

	Participation Rate (Percent)		Number of Eligible People (Thousands)	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Alabama	56	69	708	864
Alaska	69	86	51	64
Arizona	57	69	595	724
Arkansas	45	58	439	572
California	56	65	4,713	5,488
Colorado	53	71	323	433
Connecticut	63	81	270	344
Delaware	65	81	65	81
District of Columbia	63	78	117	145
Florida	56	64	2,063	2,379
Georgia	66	78	1,004	1,180
Hawaii	89	100	127	140
Idaho	50	61	121	149
Illinois	69	81	1,341	1,573
Indiana	66	78	478	568
Iowa	60	77	223	285
Kansas	58	72	241	296
Kentucky	69	85	593	723
Louisiana	61	78	859	1,084
Maine	82	100	125	150
Maryland	68	83	445	538
Massachusetts	55	71	537	692
Michigan	73	86	1,062	1,255
Minnesota	63	78	374	465
Mississippi	64	79	560	693
Missouri	70	91	580	754
Montana	48	64	102	135
Nebraska	56	73	130	169
Nevada	51	64	147	187
New Hampshire	63	79	64	81
New Jersey	68	82	636	767
New Mexico	57	69	328	399
New York	69	79	2,674	3,048
North Carolina	54	68	876	1,091
North Dakota	51	67	55	73
Ohio	75	86	1,204	1,395
Oklahoma	57	70	498	614
Oregon	67	80	333	402
Pennsylvania	76	89	1,250	1,466
Rhode Island	73	90	100	122
South Carolina	48	60	563	713
South Dakota	43	60	79	111
Tennessee	68	81	756	897
Texas	68	75	3,270	3,607
Utah	64	83	130	168
Vermont	80	97	57	69
Virginia	66	80	640	776
Washington	71	86	516	620
West Virginia	88	99	288	323
Wisconsin	60	73	407	496
Wyoming	56	69	44	54
United States	68	71	35,455	37,104

TABLE III.5

APPROXIMATE 90-PERCENT CONFIDENCE INTERVALS FOR FINAL SHRINKAGE ESTIMATES FOR SEPTEMBER 1996

	Participation Rate (Percent)		Number of Eligible People (Thousands)	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Alabama	59	75	647	811
Alaska	69	87	53	67
Arizona	53	66	616	761
Arkansas	54	65	407	493
California	56	66	4,479	5,279
Colorado	52	67	334	432
Connecticut	53	69	304	392
Delaware	58	75	74	96
District of Columbia	60	73	122	150
Florida	55	65	1,997	2,345
Georgia	59	71	1,042	1,248
Hawaii	79	100	131	164
Idaho	51	65	111	141
Illinois	63	74	1,401	1,639
Indiana	61	75	469	577
Iowa	56	72	229	291
Kansas	55	70	224	287
Kentucky	64	79	577	712
Louisiana	61	77	798	1,015
Maine	75	92	134	165
Maryland	61	73	473	566
Massachusetts	57	65	554	631
Michigan	67	79	1,087	1,287
Minnesota	58	74	360	463
Mississippi	64	83	497	639
Missouri	64	83	609	788
Montana	49	61	105	131
Nebraska	53	67	140	178
Nevada	49	64	135	176
New Hampshire	56	72	65	83
New Jersey	59	71	711	857
New Mexico	57	68	325	389
New York	63	73	2,745	3,179
North Carolina	61	69	864	975
North Dakota	51	69	53	72
Ohio	65	74	1,242	1,406
Oklahoma	54	63	514	601
Oregon	60	73	351	429
Pennsylvania	68	80	1,274	1,498
Rhode Island	66	82	104	129
South Carolina	57	71	491	608
South Dakota	47	65	72	99
Tennessee	63	77	795	960
Texas	60	68	3,204	3,647
Utah	64	80	126	156
Vermont	70	84	61	73
Virginia	59	72	687	830
Washington	65	77	550	646
West Virginia	81	96	290	344
Wisconsin	52	67	368	471
Wyoming	56	69	45	56
United States	64	67	35,406	37,071

TABLE III.6

APPROXIMATE 90-PERCENT CONFIDENCE INTERVALS FOR FINAL SHRINKAGE ESTIMATES FOR SEPTEMBER 1997

	Participation Rate (Percent)		Number of Eligible People (Thousands)	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Alabama	55	68	616	767
Alaska	73	92	44	56
Arizona	51	61	529	629
Arkansas	49	59	429	511
California	59	65	3,657	4,050
Colorado	47	65	289	399
Connecticut	52	70	282	381
Delaware	60	77	60	77
District of Columbia	73	93	93	119
Florida	53	60	1,692	1,903
Georgia	52	65	945	1,194
Hawaii	89	100	121	134
Idaho	44	57	105	136
Illinois	68	80	1,181	1,378
Indiana	57	72	442	557
Iowa	56	73	196	257
Kansas	51	67	187	245
Kentucky	64	77	528	639
Louisiana	59	75	698	884
Maine	76	94	119	147
Maryland	61	76	429	538
Massachusetts	43	56	529	687
Michigan	67	81	936	1,132
Minnesota	51	67	333	442
Mississippi	59	78	450	595
Missouri	58	75	535	693
Montana	56	69	86	107
Nebraska	60	76	118	149
Nevada	42	52	136	168
New Hampshire	45	60	65	86
New Jersey	53	67	646	807
New Mexico	57	72	242	306
New York	61	70	2,422	2,746
North Carolina	52	63	844	1,021
North Dakota	52	69	47	61
Ohio	64	75	1,053	1,217
Oklahoma	75	90	426	512
Oregon	64	76	286	334
Pennsylvania	69	80	1,162	1,354
Rhode Island	61	75	103	126
South Carolina	58	68	482	567
South Dakota	50	66	67	88
Tennessee	62	76	699	849
Texas	54	59	2,986	3,252
Utah	56	73	124	162
Vermont	75	92	51	63
Virginia	52	63	654	790
Washington	61	75	443	544
West Virginia	90	100	267	294
Wisconsin	46	62	322	433
Wyoming	48	64	37	49
United States	63	65	31,218	32,566

TABLE III.7

APPROXIMATE 90-PERCENT CONFIDENCE INTERVALS FOR FINAL SHRINKAGE ESTIMATES FOR SEPTEMBER 1998

	Participation Rate (Percent)		Number of Eligible People (Thousands)	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Alabama	56	70	566	714
Alaska	71	89	45	57
Arizona	42	52	503	624
Arkansas	58	70	353	427
California	50	58	3,513	4,078
Colorado	44	61	282	392
Connecticut	51	68	260	345
Delaware	49	63	62	80
District of Columbia	77	100	83	105
Florida	50	57	1,601	1,806
Georgia	51	64	891	1,121
Hawaii	90	100	121	132
Idaho	41	57	91	126
Illinois	60	73	1,138	1,389
Indiana	55	68	430	534
Iowa	50	64	189	243
Kansas	46	60	180	239
Kentucky	62	77	503	625
Louisiana	62	76	678	834
Maine	74	91	115	141
Maryland	59	74	388	487
Massachusetts	43	56	472	615
Michigan	64	77	904	1,087
Minnesota	47	64	314	425
Mississippi	49	64	458	598
Missouri	56	75	511	680
Montana	51	66	86	111
Nebraska	57	73	124	157
Nevada	39	52	120	158
New Hampshire	38	52	64	87
New Jersey	51	65	594	761
New Mexico	57	74	227	294
New York	55	64	2,326	2,701
North Carolina	46	55	879	1,054
North Dakota	47	62	51	68
Ohio	53	64	1,025	1,248
Oklahoma	55	68	402	500
Oregon	56	69	295	361
Pennsylvania	62	75	1,088	1,314
Rhode Island	62	78	91	114
South Carolina	58	69	455	535
South Dakota	49	66	64	87
Tennessee	62	77	657	809
Texas	47	54	2,687	3,099
Utah	52	68	125	165
Vermont	60	75	46	58
Virginia	52	65	552	686
Washington	57	70	437	531
West Virginia	83	100	244	290
Wisconsin	41	56	307	427
Wyoming	46	63	35	48
United States	58	61	29,823	31,349

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APPENDIX

THE ESTIMATION PROCEDURE: ADDITIONAL TECHNICAL DETAILS

This appendix provides additional information and technical details about our four-step procedure to estimate state food stamp participation rates. Each step is discussed in turn.

1. From CPS data and FSP administrative data, derive direct sample estimates of state food stamp participation rates for September in each of the five years 1994 to 1998.

Table A.1 displays direct sample estimates of participation rates, and Table A.2 shows standard errors for the sample estimates. The method for obtaining the standard errors is described later.

We derived sample estimates of participation rates for September of a given year according to:

$$(1) \quad Y_i = 100 \frac{P_i(1 - \varepsilon_i/100)}{(E_i/100)T_i},$$

where Y_i is the estimated participation rate for state i ; P_i is the number of persons receiving food stamps in September of the year in question according to FSP Statistical Summary of Operations (“Program Operations”) data; ε_i is the issuance error rate, that is, the percentage of persons erroneously receiving food stamps according to FSP Quality Control (FSPQC) data; E_i is the percentage of persons who are eligible for food stamps according to the CPS; and T_i is the resident population according to decennial census and administrative records (mainly vital statistics) data.^{1,2,3}

¹If P_i includes persons who received disaster relief benefits issued after a major natural disaster, P_i is adjusted by linearly interpolating between the participant figures for the months immediately before and after the period during which disaster relief was provided. This adjustment seeks to exclude from our estimate of participants those persons who received food stamps only because of a natural disaster, are not otherwise eligible, and, thus, are not included in our estimate of eligibles. It allows us to measure a state’s participation rate under “normal” circumstances. Because P_i is obtained from FSP Program Operations data, which include the full population of food stamp cases, it is not subject to sampling error. Participant figures were provided by the Food and Nutrition Service (FNS).

² ε_i is a fiscal year figure. We used fiscal year 1994, 1995, 1996, 1997, and 1998 issuance error rate estimates in Equation (1) when we derived, respectively, September 1994, 1995, 1996, 1997, and 1998 participation rates. We adjust for issuance errors to exclude from our estimate of participants those persons who were ineligible for food stamps and, thus, are not included in our estimate of eligibles. Although issuance error rates are estimated from FSPQC sample data and subject to sampling error, this sampling error is small relative to other sources of error in the estimated participation rates. Thus, the sampling error in ε_i is ignored in subsequent calculations. Issuance error estimates were provided by FNS.

³We obtained September 1 population estimates for a given year by averaging the July 1 estimates published by the Census Bureau for that year and the next year. The weights were 5/6 and 1/6, respectively. In broad terms, the estimates derived by the Census Bureau in its Population Estimates Program are obtained by subtracting from census counts persons “exiting” the population (due to death or net out-migration) and adding persons “entering” the population (due to

As noted, we estimated eligibility percentages rather than eligibility counts from the CPS. Estimated percentages are more precise than estimated counts because the sampling errors in the numerators and denominators of percentages tend to be positively correlated and, therefore, partially “cancel out.”⁴ Tables A.3, A.4, and A.5 present estimates for 1994 to 1998 of, respectively, the number of people receiving food stamps, food stamp issuance error rates, and population totals. Table A.6 displays direct sample estimates of food stamp eligibility percentages for 1994 to 1998.

We derived food stamp eligibility estimates for states by applying food stamp program rules as of September to CPS households. However, some key information needed to determine whether a household is eligible for food stamps is not collected in the CPS. For example, there are no data on asset balances or expenses deductible from gross income. Also, it is not possible to ascertain directly which members of a dwelling unit purchase and prepare food together or which members may be ineligible for food stamps under provisions of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. 104-193) and subsequent legislation pertaining to noncitizens and unemployed able-bodied adults ages 18 to 50 with no dependent children (ABAWDs). Yet another limitation is that only annual, rather than monthly, income amounts are recorded.

Methods have been developed to address these data limitations. These methods—including procedures for identifying the members of the food stamp household within the (potentially) larger

Continued

birth or net in-migration). The population estimates that we used were released on August 30, 2000 at http://www.census.gov/population/www/estimates/st_sasrh.html. Although the Census Bureau does not adjust its published population estimates for net undercount in the (1990) decennial census, we have adjusted our T_i figures using a state net population adjustment matrix published by the Census Bureau at <http://www.census.gov/population/www/censusdata/adjustment.html>. The sampling errors in the net undercount estimates are ignored in our subsequent estimates of statistical uncertainty.

⁴We obtained estimates for 1994 to 1998 from the March CPS samples for 1995 to 1999, for which the survey instruments collected family income data for the prior calendar years, that is, 1994 to 1998. In calculating sample eligibility estimates for 1994, we used race codes and sample weights that were developed by Jeffrey Passel of The Urban Institute to correct for inconsistencies between the race codes on the March 1995 CPS public use file and the population estimates that were used by the Census Bureau to create the weights on that file.

CPS household, taking account of the restrictions on participation by noncitizens and ABAWDs, distributing annual amounts across months, and imputing net income—are described in Castner (2000) and earlier reports in that series.⁵

In addition to our point estimates of participation rates, we need estimates of their sampling variability. We estimated variances for the sample estimates and covariances between sample estimates for different years using the jackknife estimator proposed by Rao, Wu, and Yue (1992), treating CPS rotation groups as clusters. A rotation group, about one-eighth of a monthly CPS sample, consists of a group of households (actually, housing units) that begin the CPS at the same time. They are in the CPS for four months, rotate out for eight months, and rotate back in for four months, after which they are dropped from the CPS.

To obtain jackknife estimates of sampling error variances and covariances, we let Z_i equal the CPS sample estimate of the number of eligible people in state i ($i = 1, 2, \dots, 51$) and $Z_{i,r}$ equal the contribution of rotation group r ($r = 1, 2, \dots, 8$) to that estimate. In other words:

$$(2) \quad Z_i = \sum_{r=1}^8 Z_{i,r}.$$

We also let N_i equal the CPS sample estimate of the population in state i and $N_{i,r}$ equal the contribution of rotation group r to that estimate. That is:

$$(3) \quad N_i = \sum_{r=1}^8 N_{i,r}.$$

If, as described before, E_i equals the CPS sample estimate of the percentage eligible in state i :

$$(4) \quad E_i = 100 \frac{Z_i}{N_i}.$$

⁵These reports also describe how we applied the food stamp gross and net income tests and calculated the benefits for which an eligible household would qualify. The reports also note that an SSI recipient who receives cash instead of food stamps in an SSI cashout state is not eligible for food stamps. (The only SSI cashout state is California.) We excluded these SSI recipients when identifying the members of food stamp households.

If we were to exclude the observations in rotation group r , we could estimate the percentage eligible in state i and the participation rate for state i by:

$$(5) \quad E_{i(r)} = 100 \frac{Z_i - Z_{i,r}}{N_i - N_{i,r}}$$

and

$$(6) \quad Y_{i(r)} = 100 \frac{P_i(1 - \varepsilon_i / 100)}{(E_{i(r)} / 100)T_i}.$$

The “(r)” subscript indicates that rotation group r has been excluded. By excluding each of the eight rotation groups in turn, we obtain eight alternative estimates for the participation rate in state i . Then, we can assess the degree of sampling variability (estimate the variance of Y_i) by measuring the variability among the eight estimates according to:

$$(7) \quad \text{var}(Y_i) = \frac{7}{8} \sum_{r=1}^8 (Y_{i(r)} - Y_i)^2.$$

The factor 7/8 enters this expression because the $Y_{i(r)}$ are obtained from samples that are only 7/8 the size of the full CPS sample for state i and, hence, are expected to be more variable than Y_i (by a factor of 8/7). Our jackknife estimate of the standard error of Y_i is obtained by taking the square root of $\text{var}(Y_i)$. Estimated jackknife standard errors for the direct estimates of participation rates were presented earlier in Table A.2.

We derived a preliminary estimate of the covariance between $Y_{i,t}$ and $Y_{i,t-g}$, the sample estimate for one year and the sample estimate for g years earlier, according to either:

$$(8) \quad \text{cov}(Y_{i,t}, Y_{i,t-g}) = \frac{7}{8} \left[\sum_{r=1}^4 (Y_{i(r),t} - Y_{i,t})(Y_{i(r+4),t-g} - Y_{i,t-g}) + \sum_{r=5}^8 (Y_{i(r),t} - Y_{i,t})(Y_{i(r-4),t-g} - Y_{i,t-g}) \right],$$

if g is odd, or:

$$(9) \quad \text{cov}(Y_{i,t}, Y_{i,t-g}) = \frac{7}{8} \left[\sum_{r=1}^8 (Y_{i(r),t} - Y_{i,t})(Y_{i(r),t-g} - Y_{i,t-g}) \right],$$

if g is even. The correlation between $Y_{i,t}$ and $Y_{i,t-g}$ is:

$$(10) \quad \text{corr}(Y_{i,t}, Y_{i,t-g}) = \frac{\text{cov}(Y_{i,t}, Y_{i,t-g})}{\sqrt{\text{var}(Y_{i,t}) \text{var}(Y_{i,t-g})}}.$$

To improve the precision of estimated correlations (and covariances), we used a simple smoothing technique in which we “replaced” the state-specific correlation from Equation (10) by the average correlation between $Y_{i,t}$ and $Y_{i,t-g}$ across states:

$$(11) \quad \overline{\text{corr}}(Y_t, Y_{t-g}) = \frac{\sum_{i=1}^{51} (n_{i,t} + n_{i,t-g}) \text{corr}(Y_{i,t}, Y_{i,t-g})}{\sum_{i=1}^{51} (n_{i,t} + n_{i,t-g})},$$

where $n_{i,t}$ and $n_{i,t-g}$ are the (unweighted) number of households in the March CPS samples for one year and g years earlier, respectively. Using this average correlation, we obtained as our final estimate of the covariance between $Y_{i,t}$ and $Y_{i,t-g}$:

$$(12) \quad \text{cov}(Y_{i,t}, Y_{i,t-g}) = \overline{\text{corr}}(Y_t, Y_{t-g}) \sqrt{\text{var}(Y_{i,t}) \text{var}(Y_{i,t-g})}.$$

As described under Step 3, the variances and covariances obtained according to Equations (7) and (12) are the elements of a variance-covariance matrix used in deriving shrinkage estimates of participation rates.

2. Using a regression model, predict state food stamp participation rates based on administrative and decennial census data.

Our regression model consisted of five equations predicting food stamp participation rates for (1) 1994, (2) 1995, (3) 1996, (4) 1997, and (5) 1998, respectively. The five equations were estimated jointly. Although the values of the regression coefficients could vary from equation to equation, each equation had the same “best” predictors. The predictors were (in addition to an intercept):

- the percentage of the population receiving food stamps
- the child poverty rate according to individual income tax data, namely, the percentage of child exemptions that are claimed on tax returns with income below the federal poverty level
- the tax return nonfiler rate for elderly people, that is, the percentage of the elderly population that is not claimed as exemptions on tax returns
- per capita income
- the percentage of people at or below 130 percent of the federal poverty level in 1989 according to the 1990 Decennial Census
- the percentage of adults who are noncitizens according to the 1990 Decennial Census
- a dummy variable equal to one for the Mountain Plains Region (and zero for other regions)

The values for the last three predictors are the same in each of the five equations of our regression model. However, for the first four predictors, we used 1994 values in the equation for predicting 1994 participation rates, 1995 values in the equation for predicting 1995 rates, and so forth. Because prediction errors were allowed to be correlated and intertemporal correlations among direct sample estimates were taken into account as specified in the next step, the shrinkage estimates for any one year were determined by the predictions and sample estimates for all five years.

In addition to the seven predictors that we selected for our “best” model, we considered many other potential predictors measuring, for example, Unemployment Insurance program participation, average adjusted gross income on tax returns, and the prevalence of households with no children. All of the predictors considered had three characteristics: (1) they are face valid, that is, it is plausible that they are good indicators of differences among states in food stamp participation rates; (2) they could be defined and measured uniformly across states for every year from 1994 to 1998; and (3) they could be obtained from nonsample or highly precise sample data—such as census or administrative records data—and, thus, measured with little or no sampling error.

As shown in the next step, where we describe the regression estimation procedure in more detail, we do not have to calculate regression estimates as a separate step, although we do have to select a best regression model before we can calculate shrinkage estimates. We selected our best model on the basis of its strong relative performance in predicting participation rates, judging performance by examining functions of the regression residuals, such as mean squared error.⁶ In addition to assessing the predictive fit of alternative specifications, we checked for potential biases as part of our extensive model evaluation. To check for biases, we looked for a persistent tendency to under- or overpredict the number of eligibles or changes in the number of eligibles for certain types of states categorized by, for example, population size, population growth rate, percentage of the population that is black or Hispanic, percentage of the population that lives in rural areas, region, and welfare program characteristics. Our assessment of model bias led us to include as a predictor a dummy variable for the Mountain Plains Region. We found no other strong evidence of bias.

Definitions and data sources for the predictors in our best regression model are given in Table A.7. Values for the last three predictors listed above are the same in each of the five year-specific regression equations, and are displayed in Table A.8. Values for the other predictors, which are updated each year, are presented in Tables A.9 to A.13. Regression estimates of participation rates are in Table A.14, and standard errors for the regression estimates are in Table A.15.

⁶The regression equations do not express causal relationships. They do not imply, for example, that higher per capita income causes lower food stamp participation rates. Rather, the equations imply only statistical associations: states with higher per capita incomes typically have lower participation rates than states with lower per capita incomes. For this reason, predictors are often called “symptomatic indicators.” They are symptomatic of differences among states in conditions associated with having higher or lower participation rates.

3. Using “shrinkage” methods, average the direct sample estimates and regression predictions to obtain preliminary shrinkage estimates of state food stamp participation rates.

To average the direct sample estimates and the regression predictions, we used an empirical Bayes shrinkage estimator.⁷ The estimator does not have a closed-form expression from which we can calculate shrinkage estimates. Instead, we must numerically integrate over three scalar parameters— σ , ρ , and η —that measure the lack of fit of the regression model and the intertemporal correlations among regression prediction errors. To perform the numerical integration, we specified a grid of 75,645 equally-spaced points, starting with $\sigma = 0.000$, $\rho = -0.990$, and $\eta = 0.000$ and incrementing σ , ρ , and η by 0.200, 0.045, and 0.200, respectively, up to $\sigma = 8.000$, $\rho = 0.990$, and $\eta = 8.000$. For combination k of σ , ρ , and η ($k = 1, 2, \dots, 75645$), we calculated a vector of shrinkage estimates:

$$(13) \quad \theta_k = (\Sigma_k^{-1} + V^{-1})^{-1} (\Sigma_k^{-1} X \hat{B}_k + V^{-1} Y),$$

a variance-covariance matrix:

$$(14) \quad U_k = (\Sigma_k^{-1} + V^{-1})^{-1} + (\Sigma_k^{-1} + V^{-1})^{-1} \Sigma_k^{-1} X (X' (\Sigma_k + V)^{-1} X)^{-1} X' \Sigma_k^{-1} (\Sigma_k^{-1} + V^{-1})^{-1},$$

and a probability:

$$(15) \quad p_k^* = |\Sigma_k + V|^{1/2} / |X' (\Sigma_k + V)^{-1} X|^{1/2} \exp \left(-\frac{1}{2} (Y - X \hat{B}_k)' (\Sigma_k + V)^{-1} (Y - X \hat{B}_k) \right).$$

In these expressions, Y is a column vector of direct sample estimates (from Step 1) with 255 elements, five sample estimates for each of the 51 states. The first five elements of Y pertain to the first state, the next five to the second state, and so forth. For a given state, the five elements are the

⁷Although our shrinkage estimator averages direct sample and regression estimates, a state’s shrinkage estimate in a given year does not have to be between the sample and regression estimates for that year. It may be above both of those estimates if, for example, they seem too low based on data from other years. Only in a few instances is a shrinkage estimate presented in this report outside the interval between the sample and regression estimates. In all of those instances, the shrinkage estimate is close to either the sample or regression estimate, and it is almost always close to both because the sample and regression estimates are close to each other.

sample estimates for 1994, 1995, 1996, 1997, and 1998, respectively. The vector of shrinkage estimates, θ_k , has the same structure as the vector of sample estimates, Y . V is the (255×255) variance-covariance matrix for the sample estimates. Because state samples are independent in the CPS, V is block-diagonal with 51 (5×5) blocks. We described under Step 1 how we derived estimates for the elements of V . X is a (255×40) matrix containing values for each of the seven predictors (plus an intercept) for every state and every year (1994, 1995, 1996, 1997, and 1998). The first five rows of X —one row for each of the five years (in chronological order)—pertain to the first state, the next five rows pertain to the second state, and so forth. The five rows for state i are given by:

$$(16) \quad X_i = \begin{pmatrix} x'_{i1} & \underline{0} & \underline{0} & \underline{0} & \underline{0} \\ \underline{0} & x'_{i2} & \underline{0} & \underline{0} & \underline{0} \\ \underline{0} & \underline{0} & x'_{i3} & \underline{0} & \underline{0} \\ \underline{0} & \underline{0} & \underline{0} & x'_{i4} & \underline{0} \\ \underline{0} & \underline{0} & \underline{0} & \underline{0} & x'_{i5} \end{pmatrix},$$

where x'_{it} is a row vector for year t ($t = 1$ for 1994, $t = 2$ for 1995, and so forth) with eight elements—an intercept plus the seven predictors listed under Step 2—and $\underline{0}$ is a row vector with eight zeros.

\hat{B}_k is a (40×1) vector of regression coefficients, and is given by:

$$(17) \quad \hat{B}_k = (X'(\Sigma_k + V)^{-1}X)^{-1}X'(\Sigma_k + V)^{-1}Y.$$

Finally, Σ_k is a block-diagonal matrix with 51 (5×5) blocks, and every block equals:

$$(18) \quad \Sigma_k^* = \sigma_k^2 \begin{pmatrix} 1 & \rho_k & \rho_k^2 & \rho_k^3 & \rho_k^4 \\ \rho_k & 1 & \rho_k & \rho_k^2 & \rho_k^3 \\ \rho_k^2 & \rho_k & 1 & \rho_k & \rho_k^2 \\ \rho_k^3 & \rho_k^2 & \rho_k & 1 & \rho_k \\ \rho_k^4 & \rho_k^3 & \rho_k^2 & \rho_k & 1 \end{pmatrix} + \eta_k^2 \begin{pmatrix} 11111 \\ 11111 \\ 11111 \\ 11111 \\ 11111 \end{pmatrix}.$$

More generally, the (f, g) element of Σ_k^* is $\Sigma_k^*(f, g) = \sigma_k^2 \rho_k^{|f-g|} + \eta_k^2$.⁸

After calculating θ_k , U_k , and p_k^* 75,645 times (once for each combination of σ , ρ , and η), we calculated the probability of $(\sigma_k, \rho_k, \eta_k)$:

$$(19) \quad p_k = \frac{p_k^*}{\sum_{k=1}^{75,645} p_k^*},$$

which is also an estimate of the probability that the shrinkage estimates θ_k are the true values. As Equation (19) suggests, the p_k are obtained by normalizing the p_k^* to sum to one.

To complete the numerical integration over σ , ρ , and η and obtain a single set of shrinkage estimates, we calculated a weighted sum of the 75,645 sets of shrinkage estimates, weighting each set θ_k by its associated probability p_k . Thus, our shrinkage estimates are:

$$(20) \quad \theta = \sum_{k=1}^{75,645} p_k \theta_k.$$

We call these estimates “preliminary” because we make some fairly small adjustments to them in the next step to derive our “final” estimates. The variance-covariance matrix for our preliminary shrinkage estimates is:

$$(21) \quad U = \sum_{k=1}^{75,645} p_k U_k + \sum_{k=1}^{75,645} p_k (\theta_k - \theta)(\theta_k - \theta)'$$

The first term on the right side of this expression reflects the error from sampling variability and the lack of fit of the regression model. The second term captures how the shrinkage estimates vary as

⁸When both $\sigma_k = 0$ and $\eta_k = 0$, we set $\theta_k = X(X'V^{-1}X)^{-1}X'V^{-1}Y$ and $U_k = X(X'V^{-1}X)^{-1}X'$, their limiting values.

σ , ρ , and η vary. Thus, the second term accounts for the variability from not knowing and, thus, having to estimate σ , ρ , and η . As described later, standard errors of the final shrinkage estimates for states are calculated as functions of the square roots of the diagonal elements of U .

Regression estimates can be similarly obtained. They are:

$$(22) \quad R = \sum_{k=1}^{75,645} p_k R_k ,$$

where $R_k = X\hat{B}_k$ is the vector of regression estimates obtained when $\sigma = \sigma_k$, $\rho = \rho_k$, and $\eta = \eta_k$. The variance-covariance matrix is:

$$(23) \quad G = \sum_{k=1}^{75,645} p_k G_k + \sum_{k=1}^{75,645} p_k (R_k - R)(R_k - R)' ,$$

where $G_k = X(X'(\Sigma_k + V)^{-1}X' + \Sigma_k)^{-1}X' + \Sigma_k$. We can estimate the regression coefficient vector by:

$$(24) \quad \hat{B} = \sum_{k=1}^{75,645} p_k \hat{B}_k .$$

Regression estimates of participation rates were presented before in Table A.14. Preliminary shrinkage estimates of participation rates are displayed in Table A.16.

4. Adjust the preliminary shrinkage estimates to obtain final shrinkage estimates of state food stamp participation rates.

We adjusted the preliminary shrinkage estimates of participation rates in two ways. First, we adjusted the rates so that the eligibles counts implied by the rates sum to the national eligibles count estimated directly from the CPS. Second, we adjusted the rates so that no state's estimated rate is greater than 100 percent. These adjustments were carried out for each year separately. The following description of the adjustments will focus on the 1998 estimates.

To implement the first adjustment, we calculated preliminary estimates of eligibles counts according to:

$$(25) \quad \psi_i = \frac{P_i(1 - \varepsilon_i/100)}{(\theta_i/100)},$$

where ψ_i is the preliminary eligibles count for state i , P_i and ε_i are the participant count and issuance error rate figures used in Equation (1), and θ_i is the preliminary participation rate derived in Equation (20). The state eligibles counts from Equation (25) summed to 31,752,376 for 1998, while the national total for 1998 estimated directly from the CPS was 30,586,224. To obtain estimated eligibles counts for states that sum (aside from rounding error) to the direct estimate of the national total, we multiplied each of the eligibles counts from Equation (25) by $30,586,224 \div 31,752,376$ (≈ 0.9633).⁹

After carrying out this first adjustment, one state had fewer estimated eligibles than participants, implying a participation rate over 100 percent.¹⁰ To cap participation rates at 100 percent, we performed a second adjustment. Specifically, we took eligibles away from the 50 states that had enough eligibles (that is, more eligibles than participants) and gave them to the state that did not have enough, stopping when the number of eligibles in that state equaled the number of participants. Eligibles were taken away from states in proportion to their numbers of eligibles. This adjustment, which moved very small numbers of eligibles among states, did not change the national total. Moreover, except for the state with a participation rate initially over 100 percent, this adjustment did not change any state's participation rate by more than two-hundredths of a percentage point.

⁹The adjustment factors for the other four years (1994 to 1997) were, respectively, 0.9899, 0.9749, 0.9776, and 0.9612. The direct estimates of the national totals for those years were 37,037,050; 36,279,378; 36,238,634; and 31,892,189.

¹⁰Hawaii had a participation rate of 104 percent. For 1995 and 1997, Hawaii had participation rates of 103 and 102 percent before this second adjustment. There were no other rates over 100 percent.

Our final shrinkage estimates of the numbers of people eligible for food stamps were shown earlier in Table III.2 of the main text. From those final shrinkage estimates of the numbers of eligible people, we calculated final shrinkage estimates of participation rates according to:

$$(26) \quad \theta_{F,i} = 100 \frac{P_i(1 - \varepsilon_i / 100)}{\psi_{F,i}},$$

where $\theta_{F,i}$ is the final shrinkage estimate of the participation rate in state i , and $\psi_{F,i}$ is the final shrinkage estimate of the number of eligible people. P_i and ε_i are the participant count and issuance error rate figures used in Equations (1) and (25). Participation rates for all states were shown in Table III.1.

In Tables III.3 to III.7 of the main text, we reported approximate 90-percent confidence intervals for our final shrinkage estimates. The upper and lower bounds of the confidence intervals were calculated according to:

$$(27) \quad \text{Upper Bound}_i = F_i + 1.645 e_i$$

and:

$$(28) \quad \text{Lower Bound}_i = F_i - 1.645 e_i,$$

where F_i is the final shrinkage estimate for state i and e_i is the standard error of that estimate. For participation rates and eligibles counts, the standard errors are, respectively:

$$(29) \quad e_i = \frac{1}{r} \sqrt{U(5i, 5i)}$$

and

$$(30) \quad e_i = \frac{\psi_{F,i}}{\theta_{F,i}} \frac{1}{r} \sqrt{U(5i, 5i)},$$

where r is the ratio used to adjust preliminary estimates of state eligibles counts to the direct estimate of the national total (≈ 0.9633 for 1998), and $U(5i, 5i)$ is the $(5i, 5i)$ diagonal element of U , which

was derived according to Equation (21).¹¹ Our estimate of e_i does not take account of the correlation between r and our preliminary shrinkage estimates for states, which were summed to obtain the denominator of r . Instead, r is treated as a constant.

Table A.17 presents final shrinkage estimates of participation rates (values of $\theta_{F,i}$), and Table A.18 presents standard errors for the rates. Tables A.19 and A.20 display final shrinkage estimates of the numbers of eligible people (values of $\psi_{F,i}$) and standard errors for those estimated counts.¹² Table A.21 shows issuance-error-adjusted numbers of people receiving food stamps (values of $P_i(1 - \varepsilon_i/100)$).

¹¹The square root of $U(5i,5i)$ is the standard error of the preliminary shrinkage estimate of the 1998 participation rate for state i . When deriving estimates for 1994, 1995, 1996, and 1997, we would use the (i,i) ; $(2i,2i)$; $(3i,3i)$; and $(4i,4i)$ diagonal elements of U , respectively.

¹²The rates and counts in Tables A.17 and A.19 are the same as the rates and counts in Tables III.1 and III.2, except for the number of digits displayed.

TABLE A.1

DIRECT SAMPLE ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	65.011	59.803	72.965	59.951	65.516
Alaska	67.775	73.951	87.257	79.481	79.753
Arizona	76.558	58.564	50.875	51.414	43.120
Arkansas	68.324	55.585	59.621	47.929	63.121
California	57.015	59.069	59.374	59.855	52.140
Colorado	82.039	85.710	64.178	79.822	69.267
Connecticut	61.664	67.797	52.845	77.716	68.270
Delaware	92.872	72.989	74.543	75.660	45.603
District of Columbia	63.055	68.281	65.760	71.682	77.707
Florida	65.993	57.509	58.677	54.929	51.987
Georgia	74.643	72.591	62.708	55.765	55.426
Hawaii	99.498	108.450	78.480	84.216	101.976
Idaho	53.168	54.243	56.218	43.116	45.835
Illinois	70.570	71.452	68.273	73.149	63.571
Indiana	59.416	73.406	81.597	69.951	65.683
Iowa	88.528	68.831	58.046	79.835	55.638
Kansas	54.864	55.611	56.445	59.199	50.796
Kentucky	75.539	90.201	72.517	71.848	74.672
Louisiana	71.923	71.901	72.364	69.892	64.070
Maine	111.637	112.070	104.542	92.899	83.780
Maryland	63.878	67.784	65.075	76.312	82.282
Massachusetts	68.730	56.945	58.087	44.558	48.867
Michigan	78.333	83.302	76.278	74.828	69.099
Minnesota	79.313	68.808	65.298	56.176	61.840
Mississippi	79.196	67.882	71.537	78.497	57.303
Missouri	86.090	102.853	100.479	65.378	79.727
Montana	79.727	58.374	51.479	58.181	55.945
Nebraska	85.808	71.969	56.623	75.477	65.464
Nevada	52.567	51.064	66.218	44.431	43.042
New Hampshire	56.647	74.249	66.787	40.544	32.648
New Jersey	65.366	85.512	66.879	60.865	62.512
New Mexico	71.624	56.823	57.358	61.391	64.085
New York	73.289	70.444	65.463	62.007	55.441
North Carolina	59.484	60.324	65.544	59.208	47.199
North Dakota	63.529	61.249	65.809	52.795	42.222
Ohio	75.783	75.315	66.520	69.062	54.893
Oklahoma	65.409	64.225	56.365	87.837	64.076
Oregon	67.225	80.459	65.513	69.997	56.880
Pennsylvania	82.749	81.377	76.410	76.494	71.800
Rhode Island	81.630	79.364	63.932	58.277	71.159
South Carolina	68.550	44.333	63.309	62.753	61.983
South Dakota	59.583	56.208	65.396	58.425	77.109
Tennessee	82.728	77.275	63.403	67.675	75.610
Texas	70.852	71.747	64.541	54.883	49.981
Utah	73.340	89.290	81.644	63.430	55.209
Vermont	124.986	103.663	75.616	95.844	72.877
Virginia	79.183	73.832	60.256	51.218	64.350
Washington	71.911	69.698	68.874	68.455	64.853
West Virginia	89.333	90.038	86.844	91.988	77.495
Wisconsin	74.738	66.524	53.296	59.728	45.220
Wyoming	68.174	58.427	60.320	44.674	46.214

TABLE A.2

STANDARD ERRORS OF DIRECT SAMPLE ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	7.756	5.958	14.096	7.253	9.157
Alaska	11.137	8.958	10.807	13.836	10.051
Arizona	7.485	6.423	6.935	3.651	3.855
Arkansas	4.003	6.080	4.641	3.338	5.148
California	1.383	2.911	3.188	1.906	2.499
Colorado	9.481	15.125	8.165	12.774	10.499
Connecticut	12.714	12.891	9.509	20.636	10.126
Delaware	12.024	10.233	15.350	11.239	6.349
District of Columbia	6.958	4.874	4.393	6.993	8.576
Florida	5.320	3.005	3.554	2.125	2.045
Georgia	5.043	4.943	5.301	7.438	6.881
Hawaii	17.939	14.421	14.759	9.712	8.416
Idaho	5.767	4.512	6.722	5.659	12.359
Illinois	5.317	5.714	4.575	4.791	7.052
Indiana	8.629	6.040	8.223	10.337	6.763
Iowa	15.036	12.758	9.819	18.222	6.801
Kansas	4.014	5.340	9.614	8.640	7.453
Kentucky	9.877	13.804	10.046	6.813	11.322
Louisiana	6.464	11.364	11.012	8.019	6.348
Maine	10.320	17.318	17.043	17.068	13.265
Maryland	10.481	8.614	5.600	14.434	12.016
Massachusetts	5.044	8.279	2.680	5.002	5.258
Michigan	4.192	7.466	6.092	8.661	6.513
Minnesota	12.495	11.256	25.420	14.641	13.831
Mississippi	8.798	6.834	10.787	11.277	6.189
Missouri	14.293	23.905	15.752	9.812	15.769
Montana	8.347	9.078	4.841	5.467	6.434
Nebraska	10.351	15.803	7.799	8.770	8.645
Nevada	7.852	8.389	11.970	3.913	5.779
New Hampshire	8.009	10.185	14.712	7.499	5.489
New Jersey	4.894	7.336	5.612	6.689	8.142
New Mexico	3.097	4.735	4.235	7.667	10.309
New York	3.038	3.418	3.699	2.748	3.046
North Carolina	3.602	6.565	2.711	4.259	3.251
North Dakota	5.455	7.789	13.646	9.157	7.972
Ohio	4.766	5.540	3.234	3.952	5.309
Oklahoma	5.095	7.842	3.514	9.186	7.499
Oregon	10.630	10.119	8.601	4.762	6.687
Pennsylvania	5.317	6.885	5.792	4.761	6.774
Rhode Island	12.911	11.627	10.334	5.819	8.295
South Carolina	7.576	5.357	7.663	3.855	3.913
South Dakota	13.367	9.592	11.696	7.835	11.702
Tennessee	5.421	6.814	7.394	7.728	10.374
Texas	2.342	2.279	2.841	1.493	2.345
Utah	11.602	15.585	7.320	9.646	8.652
Vermont	21.647	20.882	7.185	16.539	13.348
Virginia	4.073	11.706	6.870	4.540	6.949
Washington	4.679	10.343	5.209	8.809	5.786
West Virginia	6.687	3.716	5.986	11.058	9.179
Wisconsin	10.275	6.402	8.615	11.181	11.312
Wyoming	8.195	5.915	5.948	8.229	10.992

TABLE A.3

NUMBER OF PEOPLE RECEIVING FOOD STAMPS IN SEPTEMBER

	1994	1995	1996	1997	1998
Alabama	534,048	510,780	502,171	444,318	413,293
Alaska	46,127	44,346	47,318	43,653	42,934
Arizona	509,016	442,983	419,372	331,156	271,920
Arkansas	272,613	266,078	273,674	256,748	254,806
California	3,121,396	3,126,048	3,002,553	2,421,300	2,089,896
Colorado	258,733	240,229	233,505	195,353	181,924
Connecticut	223,034	225,034	217,719	206,966	187,955
Delaware	57,366	54,669	58,736	49,177	42,188
District of Columbia	91,316	93,193	90,989	88,640	84,073
Florida	1,453,184	1,395,266	1,347,443	1,049,593	952,782
Georgia	832,452	803,824	768,033	651,581	606,519
Hawaii	119,218	128,005	131,898	122,501	122,344
Idaho	75,796	77,083	74,266	62,201	56,167
Illinois	1,171,388	1,127,609	1,084,224	980,663	861,736
Indiana	503,820	406,618	366,964	333,413	300,325
Iowa	187,885	178,030	172,227	149,189	130,402
Kansas	187,317	179,208	163,172	131,189	113,826
Kentucky	512,349	512,556	468,845	419,043	396,542
Louisiana	737,828	686,988	636,356	537,326	528,505
Maine	131,048	126,857	127,892	114,592	109,166
Maryland	392,215	382,151	360,858	339,310	304,036
Massachusetts	432,947	388,751	362,114	302,932	270,681
Michigan	1,005,967	945,095	898,329	789,432	734,400
Minnesota	303,486	300,600	280,550	231,386	209,297
Mississippi	490,021	469,765	440,523	364,046	301,924
Missouri	584,551	559,377	533,036	427,033	401,870
Montana	67,994	68,305	66,640	61,963	59,336
Nebraska	107,273	101,674	98,950	94,642	96,930
Nevada	95,529	97,336	91,944	75,304	65,332
New Hampshire	59,549	54,184	48,926	41,858	34,925
New Jersey	548,328	540,118	523,812	450,085	399,602
New Mexico	234,892	233,106	228,748	179,675	177,528
New York	2,179,821	2,139,862	2,039,904	1,725,872	1,537,380
North Carolina	618,067	611,413	615,332	553,776	502,209
North Dakota	41,559	38,716	38,192	33,704	33,421
Ohio	1,204,918	1,096,742	966,034	809,849	677,477
Oklahoma	377,221	366,030	336,540	391,273	283,796
Oregon	278,652	279,207	271,491	235,359	221,115
Pennsylvania	1,185,157	1,145,441	1,072,545	955,915	852,404
Rhode Island	92,736	91,061	87,006	79,799	72,206
South Carolina	375,197	350,271	357,532	338,441	323,037
South Dakota	50,500	49,100	48,412	44,762	43,299
Tennessee	728,675	638,383	628,657	555,150	522,898
Texas	2,675,599	2,536,300	2,228,765	1,807,205	1,494,394
Utah	123,626	111,836	104,216	94,549	89,113
Vermont	63,851	56,695	54,400	49,772	36,956
Virginia	539,943	542,627	520,201	432,689	372,858
Washington	464,492	461,980	446,036	353,531	323,251
West Virginia	309,256	301,008	293,545	278,210	254,490
Wisconsin	329,700	307,986	255,669	206,359	181,741
Wyoming	32,914	31,576	32,358	25,012	23,252

TABLE A.4

FISCAL YEAR PERSON-LEVEL FOOD STAMP ISSUANCE ERROR RATES

	1994	1995	1996	1997	1998
Alabama	2.59	3.94	2.70	4.08	2.72
Alaska	3.81	0.31	1.70	4.67	3.92
Arizona	5.74	6.41	2.74	2.39	2.40
Arkansas	1.19	1.73	1.70	1.30	1.78
California	1.63	1.14	1.30	1.76	1.24
Colorado	2.73	1.98	2.66	1.80	3.26
Connecticut	2.10	1.81	2.43	2.16	3.78
Delaware	2.16	2.86	3.07	4.58	6.42
District of Columbia	0.97	0.38	0.65	1.13	1.59
Florida	4.36	4.25	3.55	3.28	3.95
Georgia	2.29	2.12	3.02	4.18	4.63
Hawaii	1.58	0.93	1.04	0.91	1.33
Idaho	3.74	3.13	2.37	2.06	5.53
Illinois	2.15	2.74	3.46	3.61	2.80
Indiana	6.79	7.48	2.72	2.80	1.67
Iowa	3.15	2.52	3.35	2.42	5.59
Kansas	2.71	2.55	1.91	2.63	2.34
Kentucky	1.00	1.14	1.33	1.51	1.51
Louisiana	0.78	1.74	1.57	0.94	1.75
Maine	1.76	1.61	2.29	1.62	3.44
Maryland	2.09	2.83	3.08	2.68	4.58
Massachusetts	1.34	0.66	0.62	1.19	0.77
Michigan	2.44	2.17	3.45	2.74	4.72
Minnesota	1.18	1.72	3.08	1.43	1.81
Mississippi	3.45	4.53	5.45	2.32	0.65
Missouri	3.54	4.41	3.70	5.03	2.67
Montana	1.87	2.64	2.76	3.32	2.43
Nebraska	4.34	4.31	3.75	4.07	5.98
Nevada	2.41	1.36	3.72	4.14	3.12
New Hampshire	5.42	4.80	2.79	5.57	2.51
New Jersey	1.95	3.15	2.77	2.98	2.31
New Mexico	2.96	2.30	2.79	2.16	3.27
New York	2.21	1.23	0.97	1.94	2.40
North Carolina	2.46	2.01	2.57	2.44	3.01
North Dakota	2.09	1.94	2.17	3.36	3.19
Ohio	3.92	4.74	5.09	2.56	2.25
Oklahoma	3.32	3.56	3.32	1.22	2.72
Oregon	4.40	3.20	4.85	7.81	7.10
Pennsylvania	2.81	2.44	3.87	2.13	3.06
Rhode Island	1.26	0.91	1.08	2.29	1.10
South Carolina	1.60	1.86	1.73	2.01	2.49
South Dakota	1.06	0.92	1.20	0.32	0.20
Tennessee	2.46	3.34	2.40	3.64	2.72
Texas	4.93	3.17	1.97	2.47	1.91
Utah	3.00	2.31	2.79	2.15	2.53
Vermont	2.00	2.26	5.27	4.23	4.25
Virginia	5.41	4.88	4.44	4.47	2.43
Washington	3.07	3.28	4.98	5.08	4.83
West Virginia	5.95	4.88	4.13	4.00	4.18
Wisconsin	1.51	2.66	2.38	1.71	2.04
Wyoming	2.32	3.09	1.97	3.57	1.98

TABLE A.5
POPULATION ON SEPTEMBER 1

	1994	1995	1996	1997	1998
Alabama	4,311,375	4,340,792	4,368,832	4,398,856	4,427,624
Alaska	612,002	613,199	616,831	621,164	627,179
Arizona	4,263,951	4,417,640	4,542,123	4,661,217	4,775,618
Arkansas	2,497,478	2,526,198	2,550,004	2,568,327	2,582,351
California	32,190,506	32,385,345	32,697,578	33,139,158	33,603,785
Colorado	3,737,410	3,819,979	3,895,287	3,973,714	4,052,970
Connecticut	3,289,338	3,287,084	3,288,778	3,290,690	3,295,642
Delaware	722,297	731,975	740,651	748,770	757,884
District of Columbia	584,154	570,563	558,143	548,988	542,479
Florida	14,259,835	14,486,423	14,730,420	14,981,599	15,202,835
Georgia	7,212,320	7,355,133	7,500,517	7,653,812	7,804,455
Hawaii	1,196,009	1,202,155	1,206,257	1,210,522	1,210,651
Idaho	1,162,939	1,191,340	1,214,084	1,236,575	1,256,942
Illinois	11,933,089	12,011,058	12,077,532	12,135,998	12,194,318
Indiana	5,781,425	5,827,101	5,869,252	5,906,345	5,941,598
Iowa	2,842,962	2,853,763	2,861,094	2,867,135	2,874,057
Kansas	2,589,593	2,606,333	2,618,782	2,637,564	2,658,735
Kentucky	3,889,434	3,920,429	3,946,392	3,973,112	3,999,609
Louisiana	4,404,429	4,424,125	4,435,217	4,447,634	4,458,653
Maine	1,246,853	1,247,311	1,251,273	1,254,812	1,257,675
Maryland	5,092,973	5,130,421	5,164,293	5,200,296	5,238,188
Massachusetts	6,066,224	6,095,886	6,120,115	6,150,006	6,179,242
Michigan	9,663,553	9,739,597	9,813,402	9,857,754	9,893,995
Minnesota	4,592,263	4,632,156	4,674,055	4,713,839	4,754,259
Mississippi	2,724,473	2,750,445	2,770,042	2,791,545	2,810,683
Missouri	5,320,568	5,363,951	5,406,554	5,444,316	5,474,819
Montana	876,504	889,192	896,312	898,158	899,388
Nebraska	1,634,192	1,647,604	1,659,431	1,667,206	1,672,024
Nevada	1,496,983	1,566,590	1,638,690	1,715,976	1,783,716
New Hampshire	1,144,520	1,157,505	1,172,221	1,184,710	1,197,749
New Jersey	7,972,260	8,018,549	8,062,726	8,106,748	8,149,196
New Mexico	1,706,775	1,734,971	1,757,547	1,773,303	1,783,185
New York	18,435,363	18,429,406	18,423,367	18,425,514	18,445,078
North Carolina	7,207,835	7,331,914	7,453,962	7,574,333	7,689,457
North Dakota	644,307	646,013	646,786	644,669	641,365
Ohio	11,193,879	11,235,838	11,266,364	11,291,795	11,315,990
Oklahoma	3,306,840	3,327,045	3,351,221	3,375,945	3,400,055
Oregon	3,150,480	3,204,656	3,257,406	3,304,012	3,342,029
Pennsylvania	12,079,012	12,079,745	12,070,415	12,049,722	12,037,038
Rhode Island	994,278	990,546	989,276	988,656	989,790
South Carolina	3,745,075	3,779,486	3,820,527	3,871,356	3,920,309
South Dakota	730,784	735,536	737,602	737,721	738,057
Tennessee	5,263,399	5,340,594	5,411,744	5,474,832	5,528,513
Texas	18,881,597	19,220,508	19,550,818	19,901,301	20,254,061
Utah	1,968,569	2,014,764	2,059,854	2,101,668	2,135,851
Vermont	585,898	589,758	593,081	595,327	597,449
Virginia	6,674,276	6,738,810	6,803,457	6,869,004	6,929,908
Washington	5,442,921	5,536,185	5,617,657	5,710,064	5,791,258
West Virginia	1,844,778	1,846,240	1,844,360	1,840,881	1,836,838
Wisconsin	5,132,688	5,173,408	5,208,496	5,234,150	5,257,111
Wyoming	485,625	488,785	490,141	490,098	490,036

TABLE A.6

DIRECT SAMPLE ESTIMATES OF PERCENTAGES OF PEOPLE ELIGIBLE FOR FOOD STAMPS

	1994	1995	1996	1997	1998
Alabama	18.560	18.901	15.328	16.161	13.860
Alaska	10.697	9.749	8.642	8.429	8.247
Arizona	14.698	16.025	17.651	13.488	12.888
Arkansas	15.786	18.621	17.695	20.586	15.354
California	16.730	16.155	15.265	11.992	11.780
Colorado	8.208	7.192	9.092	6.048	6.269
Connecticut	10.765	9.915	12.223	7.918	8.038
Delaware	8.367	9.940	10.312	8.283	11.423
District of Columbia	24.551	23.830	24.629	22.270	19.627
Florida	14.769	16.036	15.036	12.336	11.579
Georgia	15.109	14.736	15.836	14.628	13.372
Hawaii	9.860	9.727	13.788	11.907	9.778
Idaho	11.800	11.555	10.623	11.426	9.210
Illinois	13.611	12.779	12.694	10.648	10.805
Indiana	13.671	8.795	7.454	7.844	7.567
Iowa	7.230	8.835	10.023	6.360	7.699
Kansas	12.827	12.049	10.828	8.181	8.231
Kentucky	17.264	14.329	16.165	14.458	13.077
Louisiana	23.110	21.221	19.516	17.123	18.177
Maine	9.249	8.929	9.553	9.671	10.004
Maryland	11.804	10.678	10.407	8.321	6.731
Massachusetts	10.245	11.125	10.123	10.923	8.895
Michigan	12.965	11.396	11.587	10.409	10.235
Minnesota	8.234	9.269	8.909	8.613	6.990
Mississippi	21.927	24.021	21.019	16.228	18.624
Missouri	12.310	9.692	9.449	11.394	8.961
Montana	9.548	12.812	14.044	11.464	11.506
Nebraska	7.318	8.205	10.136	7.215	8.326
Nevada	11.847	12.002	8.158	9.468	8.244
New Hampshire	8.687	6.002	6.075	8.229	8.707
New Jersey	10.317	7.629	9.445	8.850	7.663
New Mexico	18.646	23.101	22.058	16.148	15.027
New York	15.777	16.280	16.750	14.813	14.673
North Carolina	14.061	13.546	12.271	12.047	13.421
North Dakota	9.941	9.595	8.778	9.570	11.948
Ohio	13.647	12.346	12.234	10.119	10.661
Oklahoma	16.861	16.520	17.225	13.034	12.672
Oregon	12.578	10.482	12.105	9.382	10.806
Pennsylvania	11.524	11.368	11.179	10.150	9.561
Rhode Island	11.282	11.478	13.608	13.533	10.139
South Carolina	14.381	20.516	14.526	13.651	12.963
South Dakota	11.475	11.767	9.916	10.352	7.593
Tennessee	16.323	14.952	17.882	14.438	12.169
Texas	19.014	17.809	17.315	16.137	14.480
Utah	8.306	6.073	6.024	6.940	7.366
Vermont	8.545	9.064	11.491	8.354	8.127
Virginia	9.664	10.374	12.126	11.749	8.158
Washington	11.503	11.580	10.954	8.585	8.191
West Virginia	17.649	17.224	17.570	15.772	17.131
Wisconsin	8.465	8.711	8.991	6.488	7.489
Wyoming	9.711	10.715	10.729	11.016	10.064

TABLE A.7
DEFINITIONS AND DATA SOURCES FOR PREDICTORS

Predictor ^a	Definition	Principal Data Source ^b
Food stamp prevalence rate	$100 \times \frac{\text{Number of people receiving food stamps in September}}{\text{Resident population in September}}$	Counts of people receiving food stamps are from FSP Program Operations data and were provided by the Food and Nutrition Service. For more information, see the first footnote of the Appendix.
Child tax poverty rate	$100 \times \frac{\text{Number of child exemptions on tax returns with adjusted gross income below the poverty level}}{\text{Total number of child exemptions on tax returns}}$	All data for constructing this predictor were provided by the U.S. Census Bureau.
Elderly tax nonfiler rate	$100 - \left(100 \times \frac{\text{Number of exemptions for people ages 65 and over on tax returns}}{\text{Population of people ages 65 and over}} \right)$	All data for constructing this predictor were provided by the U.S. Census Bureau.
Per capita income ^c	$\frac{(\text{Total personal income} \div \text{Resident population})}{\text{Poverty guideline for one-person family}}$	The total personal income amounts that we used were released on September 12, 2000 at http://www.bea.doc.gov/bea/regional/spi .
Percentage of people ≤ 130 percent of poverty	$100 \times \frac{\text{Number of people at or below 130 percent of poverty}}{\text{Population}}$	All data for constructing this predictor were obtained from Sigma One Corporation (1993), which reports estimates derived from a special extract of the 1990 Decennial Census.
Percentage of adults who are not citizens	$100 \times \frac{\text{Number of noncitizens ages 18 and over}}{\text{Population of people ages 18 and over}}$	All data for constructing this predictor were obtained from the 1990 Census Summary Tape File 3 and, specifically, Table P37 of the C90STF3C1 database, which can be accessed via http://venus.census.gov/cdrom/lookup .
Dummy variable for Mountain Plains Region	1 for CO, IA, KS, MO, MT, ND, NE, SD, UT, WY; and 0 for all other states	

^aValues for the first four predictors vary across the year-specific equations of our regression model, while values for the last three predictors do not vary.

^bFor deriving food stamp prevalence rates, we obtained September 1 population estimates for a given year by averaging the July 1 estimates published by the Census Bureau for that year and the next year. The weights were 5/6 and 1/6, respectively. The population estimates that we used were released on August 30, 2000 at http://www.census.gov/population/www/estimates/st_sasrh.html. We have adjusted the population estimates for net undercount in the (1990) decennial census using a state net population adjustment matrix published by the Census Bureau at <http://www.census.gov/population/www/censusdata/adjustment.html>. For obtaining values of per capita income, we used the 1998 and 1999 releases of the Census Bureau's resident population estimates for July 1, without adjustment for net census undercount.

^cFor Alaska, Hawaii, and the rest of the United States, respectively, the poverty guidelines used equal \$8950, \$8255, and \$7165 for 1994; \$9270, \$8540, and \$7415 for 1995; \$9500, \$8760, and \$7605 for 1996; \$9765, \$8990, and \$7815 for 1997; and \$9970, \$9165, and \$7970 for 1998. The 1994 guidelines, for example, were obtained by averaging the poverty guidelines for 1993 and 1994 that were issued by the Office of the Secretary, U.S. Department of Health and Human Services. We average the "HHS" poverty guidelines because the various income eligibility guidelines used in federal nutrition programs during calendar year 1994, for example, were based on the 1993 HHS poverty guidelines for the first part of 1994 and the 1994 HHS poverty guidelines for the remainder of 1994.

TABLE A.8
VALUES FOR TEMPORALLY CONSTANT PREDICTORS

	Percentage ≤130% FPL	Percentage Noncitizen	Mountain Plains Region
Alabama	25.052	0.649	0
Alaska	17.601	2.718	0
Arizona	21.377	5.226	0
Arkansas	26.868	0.639	0
California	17.698	16.836	0
Colorado	16.841	2.665	1
Connecticut	10.816	4.643	0
Delaware	13.757	1.737	0
District of Columbia	23.119	7.633	0
Florida	18.254	8.170	0
Georgia	20.367	1.896	0
Hawaii	14.478	7.761	0
Idaho	19.944	2.082	0
Illinois	16.692	5.413	0
Indiana	16.558	0.959	0
Iowa	18.121	0.964	1
Kansas	17.702	1.644	1
Kentucky	26.026	0.578	0
Louisiana	30.604	1.409	0
Maine	16.895	1.498	0
Maryland	12.095	4.435	0
Massachusetts	14.210	5.794	0
Michigan	18.105	2.048	0
Minnesota	15.453	1.547	0
Mississippi	33.246	0.510	0
Missouri	19.531	0.877	1
Montana	22.951	0.804	1
Nebraska	17.603	0.968	1
Nevada	14.639	5.769	0
New Hampshire	11.021	2.004	0
New Jersey	11.289	7.209	0
New Mexico	27.327	3.768	0
New York	18.127	9.819	0
North Carolina	19.232	1.136	0
North Dakota	21.810	0.763	1
Ohio	17.806	1.150	0
Oklahoma	23.950	1.380	0
Oregon	17.934	3.239	0
Pennsylvania	16.595	1.439	0
Rhode Island	15.410	5.697	0
South Carolina	22.073	0.841	0
South Dakota	23.713	0.540	1
Tennessee	22.475	0.761	0
Texas	24.344	6.986	0
Utah	16.944	2.565	1
Vermont	16.487	1.527	0
Virginia	15.464	3.386	0
Washington	15.631	4.045	0
West Virginia	26.970	0.430	0
Wisconsin	16.342	1.314	0
Wyoming	17.826	1.034	1

TABLE A.9
1994 VALUES FOR TEMPORALLY VARIABLE PREDICTORS

	Food Stamp Prevalence Rate	Child Tax Poverty Rate	Elderly Tax Nonfiler Rate	Per Capita Income
Alabama	12.387	24.234	58.179	2.633
Alaska	7.537	12.204	34.920	2.821
Arizona	11.938	23.667	45.622	2.759
Arkansas	10.916	26.304	55.850	2.477
California	9.697	22.474	45.434	3.271
Colorado	6.923	15.255	40.554	3.277
Connecticut	6.781	8.393	42.509	4.260
Delaware	7.942	16.072	40.358	3.433
District of Columbia	15.632	24.060	48.094	4.562
Florida	10.191	23.491	46.044	3.119
Georgia	11.542	21.452	54.561	2.953
Hawaii	9.968	12.590	36.684	3.072
Idaho	6.518	19.423	41.741	2.631
Illinois	9.816	15.106	41.396	3.431
Indiana	8.714	14.829	41.875	2.954
Iowa	6.609	14.043	39.092	2.861
Kansas	7.233	14.618	39.297	2.998
Kentucky	13.173	21.752	54.686	2.583
Louisiana	16.752	27.108	56.831	2.621
Maine	10.510	16.109	49.212	2.730
Maryland	7.701	12.765	43.014	3.633
Massachusetts	7.137	10.447	47.008	3.748
Michigan	10.410	15.303	42.428	3.192
Minnesota	6.609	11.319	43.259	3.274
Mississippi	17.986	29.143	63.469	2.310
Missouri	10.987	18.428	46.987	2.968
Montana	7.757	21.610	38.993	2.530
Nebraska	6.564	15.686	38.244	2.953
Nevada	6.381	15.922	40.587	3.432
New Hampshire	5.203	10.330	43.425	3.322
New Jersey	6.878	11.446	42.469	3.896
New Mexico	13.762	28.797	46.471	2.501
New York	11.824	16.473	50.479	3.679
North Carolina	8.575	19.425	54.467	2.921
North Dakota	6.450	15.635	37.504	2.657
Ohio	10.764	15.074	45.581	3.084
Oklahoma	11.407	24.411	49.531	2.612
Oregon	8.845	17.521	42.103	2.988
Pennsylvania	9.812	14.427	47.629	3.191
Rhode Island	9.327	12.923	52.236	3.175
South Carolina	10.018	22.400	56.006	2.617
South Dakota	6.910	19.223	38.942	2.712
Tennessee	13.844	21.141	55.683	2.891
Texas	14.170	27.503	50.962	2.866
Utah	6.280	13.518	40.461	2.502
Vermont	10.898	15.121	44.216	2.868
Virginia	8.090	15.328	46.452	3.309
Washington	8.534	13.500	39.526	3.224
West Virginia	16.764	22.482	58.149	2.430
Wisconsin	6.424	12.845	43.760	3.041
Wyoming	6.778	16.821	37.808	2.925

TABLE A.10

1995 VALUES FOR TEMPORALLY VARIABLE PREDICTORS

	Food Stamp Prevalence Rate	Child Tax Poverty Rate	Elderly Tax Nonfiler Rate	Per Capita Income
Alabama	11.767	24.418	57.239	2.655
Alaska	7.232	12.904	34.770	2.782
Arizona	10.028	23.627	45.425	2.782
Arkansas	10.533	26.613	54.816	2.500
California	9.653	23.221	45.597	3.297
Colorado	6.289	15.445	40.093	3.350
Connecticut	6.846	9.298	42.019	4.306
Delaware	7.469	16.011	39.787	3.437
District of Columbia	16.334	24.986	47.573	4.448
Florida	9.632	23.715	45.958	3.172
Georgia	10.929	21.853	53.634	2.996
Hawaii	10.648	13.337	37.268	3.000
Idaho	6.470	19.796	41.165	2.648
Illinois	9.388	15.572	40.716	3.485
Indiana	6.978	15.242	40.859	2.948
Iowa	6.238	13.842	38.390	2.857
Kansas	6.876	14.869	38.379	2.972
Kentucky	13.074	22.105	53.834	2.591
Louisiana	15.528	27.308	56.087	2.635
Maine	10.170	16.499	48.478	2.737
Maryland	7.449	13.141	42.307	3.624
Massachusetts	6.377	10.969	46.377	3.784
Michigan	9.704	16.005	41.764	3.235
Minnesota	6.489	11.411	42.260	3.314
Mississippi	17.080	29.148	62.468	2.318
Missouri	10.428	18.769	45.935	2.979
Montana	7.682	22.273	38.330	2.530
Nebraska	6.171	15.772	37.246	2.991
Nevada	6.213	16.314	40.627	3.472
New Hampshire	4.681	10.435	42.793	3.370
New Jersey	6.736	11.832	41.970	3.953
New Mexico	13.436	29.020	45.895	2.537
New York	11.611	17.395	49.833	3.740
North Carolina	8.339	19.797	53.425	2.958
North Dakota	5.993	15.908	36.508	2.575
Ohio	9.761	15.476	44.828	3.093
Oklahoma	11.002	25.099	48.636	2.611
Oregon	8.713	17.800	41.794	3.056
Pennsylvania	9.482	14.857	46.695	3.201
Rhode Island	9.193	13.471	51.971	3.241
South Carolina	9.268	22.647	54.794	2.638
South Dakota	6.675	19.116	38.160	2.652
Tennessee	11.953	21.416	54.661	2.943
Texas	13.196	27.664	50.410	2.894
Utah	5.551	13.330	39.826	2.546
Vermont	9.613	15.551	43.288	2.880
Virginia	8.052	15.771	45.561	3.298
Washington	8.345	14.172	39.276	3.217
West Virginia	16.304	23.101	57.312	2.414
Wisconsin	5.953	13.210	42.672	3.059
Wyoming	6.460	17.881	36.821	2.901

TABLE A.11
1996 VALUES FOR TEMPORALLY VARIABLE PREDICTORS

	Food Stamp Prevalence Rate	Child Tax Poverty Rate	Elderly Tax Nonfiler Rate	Per Capita Income
Alabama	11.494	25.196	55.915	2.675
Alaska	7.671	13.572	34.315	2.743
Arizona	9.233	23.506	44.753	2.840
Arkansas	10.732	27.271	53.552	2.555
California	9.183	23.610	45.398	3.353
Colorado	5.995	15.574	39.210	3.446
Connecticut	6.620	11.141	41.562	4.401
Delaware	7.930	16.391	38.785	3.520
District of Columbia	16.302	26.325	47.445	4.515
Florida	9.147	24.027	45.337	3.239
Georgia	10.240	22.356	52.198	3.100
Hawaii	10.934	14.583	37.523	2.933
Idaho	6.117	19.736	41.022	2.677
Illinois	8.977	16.333	39.648	3.583
Indiana	6.252	15.699	39.662	2.998
Iowa	6.020	14.016	37.202	2.987
Kansas	6.231	14.953	37.263	3.063
Kentucky	11.880	22.588	52.594	2.649
Louisiana	14.348	27.719	54.968	2.662
Maine	10.221	16.729	47.276	2.806
Maryland	6.988	13.933	41.793	3.659
Massachusetts	5.917	11.544	45.617	3.895
Michigan	9.154	16.442	40.792	3.217
Minnesota	6.002	11.423	40.787	3.453
Mississippi	15.903	29.446	61.187	2.372
Missouri	9.859	19.160	44.554	3.040
Montana	7.435	22.940	37.241	2.549
Nebraska	5.963	15.608	36.102	3.160
Nevada	5.611	16.280	40.099	3.559
New Hampshire	4.174	10.326	41.700	3.426
New Jersey	6.497	12.453	41.368	4.053
New Mexico	13.015	29.451	44.842	2.554
New York	11.072	18.601	49.112	3.850
North Carolina	8.255	20.385	52.332	3.016
North Dakota	5.905	16.581	35.759	2.784
Ohio	8.574	16.055	43.746	3.112
Oklahoma	10.042	25.611	47.615	2.645
Oregon	8.335	18.422	40.816	3.108
Pennsylvania	8.886	15.694	45.435	3.265
Rhode Island	8.795	14.671	51.313	3.302
South Carolina	9.358	23.277	53.467	2.699
South Dakota	6.563	19.600	36.924	2.832
Tennessee	11.617	21.997	53.401	2.955
Texas	11.400	27.686	49.412	2.953
Utah	5.059	13.379	38.710	2.630
Vermont	9.172	15.482	42.228	2.931
Virginia	7.646	16.394	44.570	3.352
Washington	7.940	14.736	38.584	3.319
West Virginia	15.916	23.675	56.267	2.439
Wisconsin	4.909	13.505	40.870	3.114
Wyoming	6.602	18.207	36.017	2.906

TABLE A.12

1997 VALUES FOR TEMPORALLY VARIABLE PREDICTORS

	Food Stamp Prevalence Rate	Child Tax Poverty Rate	Elderly Tax Nonfiler Rate	Per Capita Income
Alabama	10.101	24.778	56.083	2.704
Alaska	7.028	13.421	35.225	2.767
Arizona	7.104	22.372	44.519	2.913
Arkansas	9.997	26.674	53.012	2.590
California	7.306	22.801	45.824	3.419
Colorado	4.916	14.995	38.507	3.575
Connecticut	6.289	11.475	41.278	4.553
Delaware	6.568	16.391	38.792	3.523
District of Columbia	16.146	27.624	50.124	4.616
Florida	7.006	23.725	45.419	3.298
Georgia	8.513	22.134	52.494	3.141
Hawaii	10.120	15.654	37.376	2.926
Idaho	5.030	19.232	40.746	2.666
Illinois	8.081	16.138	40.125	3.663
Indiana	5.645	15.307	39.339	3.043
Iowa	5.203	13.294	36.941	3.047
Kansas	4.974	14.374	37.331	3.142
Kentucky	10.547	22.472	52.502	2.714
Louisiana	12.081	26.859	55.197	2.714
Maine	9.132	16.442	47.148	2.861
Maryland	6.525	13.938	42.332	3.738
Massachusetts	4.926	11.491	44.761	4.008
Michigan	8.008	16.467	40.311	3.276
Minnesota	4.909	11.388	39.365	3.527
Mississippi	13.041	28.518	61.012	2.418
Missouri	7.844	18.591	44.185	3.106
Montana	6.899	22.489	37.236	2.580
Nebraska	5.677	14.566	36.025	3.145
Nevada	4.388	16.048	39.243	3.606
New Hampshire	3.533	9.802	40.507	3.534
New Jersey	5.552	12.763	40.995	4.143
New Mexico	10.132	29.562	45.257	2.579
New York	9.367	19.241	48.884	3.901
North Carolina	7.311	19.814	51.983	3.097
North Dakota	5.228	15.910	35.009	2.662
Ohio	7.172	15.931	43.449	3.195
Oklahoma	11.590	24.989	47.739	2.698
Oregon	7.123	17.725	40.168	3.179
Pennsylvania	7.933	16.004	44.966	3.338
Rhode Island	8.071	14.649	50.142	3.406
South Carolina	8.742	22.697	53.550	2.758
South Dakota	6.068	18.255	36.608	2.823
Tennessee	10.140	21.647	53.170	2.990
Texas	9.081	26.234	49.832	3.089
Utah	4.499	13.036	38.573	2.715
Vermont	8.360	15.306	41.599	2.988
Virginia	6.299	16.001	44.851	3.425
Washington	6.191	14.310	38.187	3.428
West Virginia	15.113	23.792	56.022	2.481
Wisconsin	3.943	13.223	39.861	3.191
Wyoming	5.103	17.811	36.350	3.050

TABLE A.13

1998 VALUES FOR TEMPORALLY VARIABLE PREDICTORS

	Food Stamp Prevalence Rate	Child Tax Poverty Rate	Elderly Tax Nonfiler Rate	Per Capita Income
Alabama	9.334	23.426	54.168	2.775
Alaska	6.846	13.070	34.656	2.804
Arizona	5.694	20.746	43.544	3.027
Arkansas	9.867	25.451	51.389	2.667
California	6.219	21.369	45.132	3.550
Colorado	4.489	13.918	36.908	3.745
Connecticut	5.703	11.074	40.005	4.697
Delaware	5.567	15.315	37.730	3.713
District of Columbia	15.498	26.218	47.669	4.717
Florida	6.267	22.325	44.200	3.377
Georgia	7.771	20.631	50.287	3.277
Hawaii	10.106	15.750	37.801	2.910
Idaho	4.469	17.955	40.476	2.756
Illinois	7.067	15.620	39.292	3.768
Indiana	5.055	14.488	38.581	3.164
Iowa	4.537	12.430	35.712	3.116
Kansas	4.281	13.483	36.003	3.235
Kentucky	9.915	21.578	51.343	2.803
Louisiana	11.853	25.517	53.476	2.801
Maine	8.680	15.549	46.006	2.960
Maryland	5.804	13.079	40.863	3.867
Massachusetts	4.380	11.204	43.749	4.188
Michigan	7.423	15.832	39.326	3.365
Minnesota	4.402	10.746	37.776	3.702
Mississippi	10.742	26.816	59.165	2.510
Missouri	7.340	17.661	42.759	3.187
Montana	6.597	21.751	36.213	2.673
Nebraska	5.797	14.040	34.915	3.241
Nevada	3.663	15.235	38.086	3.733
New Hampshire	2.916	8.844	39.558	3.726
New Jersey	4.904	12.286	40.016	4.295
New Mexico	9.956	28.299	43.897	2.652
New York	8.335	19.041	47.739	4.041
North Carolina	6.531	18.573	50.334	3.193
North Dakota	5.211	15.450	34.740	2.855
Ohio	5.987	15.183	42.668	3.291
Oklahoma	8.347	23.765	46.398	2.779
Oregon	6.616	16.969	39.697	3.257
Pennsylvania	7.082	15.252	43.960	3.433
Rhode Island	7.295	14.033	49.377	3.512
South Carolina	8.240	21.276	51.324	2.831
South Dakota	5.867	17.745	35.399	2.956
Tennessee	9.458	20.423	51.525	3.085
Texas	7.378	24.370	48.131	3.230
Utah	4.172	12.305	37.172	2.798
Vermont	6.186	14.144	39.934	3.110
Virginia	5.380	15.036	42.998	3.555
Washington	5.582	14.062	37.342	3.592
West Virginia	13.855	23.395	55.126	2.541
Wisconsin	3.457	11.976	38.907	3.292
Wyoming	4.745	16.636	34.525	3.122

TABLE A.14

REGRESSION ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	71.074	61.928	65.108	59.906	59.710
Alaska	71.220	75.965	74.263	79.495	76.583
Arizona	73.340	62.187	60.388	54.884	47.361
Arkansas	61.003	48.726	58.019	58.092	61.316
California	57.953	58.839	59.327	56.687	53.098
Colorado	67.100	59.001	57.648	50.952	48.115
Connecticut	66.310	70.631	61.213	58.183	56.528
Delaware	71.258	70.806	65.326	64.750	57.713
District of Columbia	64.402	68.926	63.416	81.831	86.828
Florida	65.724	60.596	58.024	51.958	50.614
Georgia	74.611	68.541	64.180	56.161	55.548
Hawaii	82.115	99.958	88.079	100.406	99.614
Idaho	58.369	53.601	56.359	51.809	47.673
Illinois	72.190	74.259	66.532	69.530	63.783
Indiana	75.895	69.069	62.848	61.533	56.677
Iowa	69.913	66.689	64.224	61.134	55.644
Kansas	71.184	68.227	63.195	57.392	51.896
Kentucky	75.472	73.822	70.081	67.117	65.948
Louisiana	77.454	67.432	67.335	63.815	67.658
Maine	84.122	87.441	80.180	80.484	78.771
Maryland	71.794	75.355	65.961	65.099	61.907
Massachusetts	64.206	62.346	60.647	48.858	46.456
Michigan	76.755	76.350	69.658	70.678	67.321
Minnesota	67.027	68.879	64.459	56.508	52.706
Mississippi	79.849	70.621	71.977	63.851	54.314
Missouri	82.114	77.602	70.106	64.359	62.272
Montana	63.513	54.496	55.944	60.449	56.911
Nebraska	68.527	62.667	59.772	62.945	62.330
Nevada	59.747	57.961	55.091	48.493	44.323
New Hampshire	69.422	69.210	63.692	54.505	49.546
New Jersey	65.886	69.269	62.718	57.333	54.340
New Mexico	69.605	63.765	63.588	61.825	63.532
New York	71.101	73.759	67.923	63.819	60.414
North Carolina	65.684	59.033	61.210	53.128	51.491
North Dakota	63.066	57.065	58.114	59.357	55.084
Ohio	80.741	79.850	69.477	64.376	56.984
Oklahoma	69.051	61.979	59.611	78.343	58.535
Oregon	69.756	69.837	64.721	64.980	61.983
Pennsylvania	77.758	79.880	70.875	68.295	64.052
Rhode Island	76.098	79.939	73.857	69.045	66.350
South Carolina	67.820	57.485	62.045	58.663	59.774
South Dakota	58.026	49.486	53.404	55.994	52.693
Tennessee	82.532	71.198	69.967	66.236	65.801
Texas	71.923	64.384	58.637	53.507	46.520
Utah	74.068	70.110	67.175	62.009	58.256
Vermont	86.271	85.923	76.486	79.702	65.225
Virginia	68.915	70.379	64.932	58.062	53.815
Washington	73.038	77.617	68.891	64.510	59.241
West Virginia	91.077	92.279	86.895	96.262	90.975
Wisconsin	65.962	63.981	59.716	50.316	47.251
Wyoming	68.497	61.956	61.108	55.610	53.072

TABLE A.15

STANDARD ERRORS OF REGRESSION ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	4.763	4.814	4.802	4.787	4.804
Alaska	6.013	5.979	5.934	6.017	6.154
Arizona	4.670	4.510	4.464	4.472	4.622
Arkansas	5.173	5.232	4.899	4.680	4.710
California	5.504	5.788	5.851	5.513	5.623
Colorado	5.282	5.530	5.226	5.497	5.478
Connecticut	5.378	5.525	5.210	5.572	5.529
Delaware	5.391	5.306	5.333	5.241	5.056
District of Columbia	7.690	6.768	6.484	7.601	8.128
Florida	4.901	4.823	4.839	4.835	4.850
Georgia	4.730	4.800	4.729	4.753	4.704
Hawaii	5.893	6.719	6.836	7.214	7.154
Idaho	5.248	5.068	5.046	4.925	4.999
Illinois	4.558	4.638	4.599	4.700	4.668
Indiana	4.695	4.693	4.721	4.694	4.695
Iowa	5.066	5.294	5.129	5.260	5.217
Kansas	5.085	5.284	5.037	5.172	5.137
Kentucky	4.855	4.787	4.968	4.865	4.783
Louisiana	5.182	5.242	5.466	5.464	5.360
Maine	5.174	5.436	5.426	5.402	5.342
Maryland	4.767	4.884	4.792	4.813	4.714
Massachusetts	5.142	5.607	5.212	5.398	5.270
Michigan	4.650	4.674	4.610	4.707	4.724
Minnesota	4.847	4.941	5.006	5.097	5.189
Mississippi	5.706	5.678	6.128	6.040	5.856
Missouri	6.094	6.274	5.894	5.643	5.746
Montana	5.260	5.423	5.205	5.405	5.620
Nebraska	5.122	5.266	5.042	5.155	5.172
Nevada	4.749	4.682	4.740	4.726	4.731
New Hampshire	4.943	5.070	4.919	4.962	4.990
New Jersey	4.754	4.898	4.722	4.822	4.814
New Mexico	5.028	5.220	5.075	5.306	5.586
New York	5.004	5.067	4.904	4.809	4.854
North Carolina	4.950	5.002	4.855	4.807	4.847
North Dakota	5.584	5.794	5.683	5.550	5.378
Ohio	4.619	4.601	4.446	4.445	4.437
Oklahoma	4.513	4.607	4.599	5.057	4.691
Oregon	4.490	4.491	4.471	4.540	4.519
Pennsylvania	4.503	4.635	4.508	4.516	4.488
Rhode Island	5.189	5.317	5.184	5.141	5.339
South Carolina	4.880	4.946	4.804	4.777	4.768
South Dakota	5.656	5.845	5.792	5.606	5.526
Tennessee	4.774	4.601	4.657	4.597	4.650
Texas	4.691	4.616	4.589	4.579	4.711
Utah	5.707	5.787	5.518	5.698	5.637
Vermont	5.245	5.159	4.947	5.096	4.687
Virginia	4.434	4.494	4.427	4.429	4.407
Washington	4.694	4.772	4.653	4.677	4.669
West Virginia	5.653	5.586	6.090	6.398	6.022
Wisconsin	4.836	4.864	5.040	4.995	5.078
Wyoming	5.229	5.495	5.249	5.385	5.383

TABLE A.16

PRELIMINARY SHRINKAGE ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	69.621	60.848	65.496	59.268	60.532
Alaska	70.798	75.369	75.998	79.403	77.279
Arizona	73.918	61.305	57.943	53.652	45.379
Arkansas	63.975	50.392	58.422	51.819	61.808
California	57.154	59.073	59.375	59.330	52.387
Colorado	69.276	60.758	57.998	53.541	50.312
Connecticut	65.943	70.184	59.636	58.740	57.633
Delaware	73.171	70.739	65.364	65.780	53.701
District of Columbia	64.033	69.028	65.034	79.596	85.502
Florida	65.887	58.641	58.527	54.286	51.748
Georgia	74.554	70.238	63.587	56.111	55.379
Hawaii	82.741	100.377	87.308	98.119	100.245
Idaho	56.478	53.934	56.361	48.590	47.086
Illinois	71.796	73.401	67.312	71.031	63.848
Indiana	73.108	70.191	66.710	62.401	59.024
Iowa	71.011	66.514	62.579	61.763	54.832
Kansas	63.424	63.462	61.319	56.805	51.035
Kentucky	75.335	75.095	70.155	67.984	66.702
Louisiana	75.711	67.757	67.546	64.687	66.150
Maine	87.615	88.960	81.682	81.479	79.379
Maryland	70.880	73.700	65.786	65.690	63.895
Massachusetts	66.100	61.269	59.370	47.315	47.616
Michigan	77.211	77.810	71.427	71.400	67.717
Minnesota	68.220	68.664	64.594	56.528	53.566
Mississippi	79.886	69.809	71.711	65.447	54.718
Missouri	82.145	78.149	71.845	63.538	63.262
Montana	66.271	54.804	53.791	59.870	56.551
Nebraska	70.850	63.306	58.565	65.324	62.554
Nevada	57.884	55.980	55.614	45.622	43.834
New Hampshire	65.872	69.422	62.728	50.653	43.462
New Jersey	65.069	72.701	63.477	57.804	55.490
New Mexico	71.235	61.067	60.864	61.664	63.524
New York	72.508	72.028	66.670	62.952	57.501
North Carolina	62.272	59.380	63.715	55.673	48.545
North Dakota	62.763	57.854	58.425	58.146	52.419
Ohio	78.929	78.401	67.691	66.815	56.120
Oklahoma	67.474	61.886	57.052	79.242	58.991
Oregon	69.490	71.645	64.696	67.280	60.366
Pennsylvania	79.804	80.243	72.724	71.495	66.266
Rhode Island	76.228	79.455	72.311	65.468	67.104
South Carolina	68.054	52.525	62.507	60.765	61.292
South Dakota	58.166	49.927	54.692	55.531	55.225
Tennessee	82.521	72.766	68.360	66.431	66.822
Texas	70.970	69.629	62.344	54.320	48.811
Utah	73.873	71.588	70.229	62.105	57.719
Vermont	87.413	86.163	75.212	80.411	65.423
Virginia	73.859	71.082	64.084	55.054	56.611
Washington	73.051	76.660	69.271	65.353	61.246
West Virginia	90.516	91.448	86.846	95.777	88.808
Wisconsin	67.246	64.743	58.204	51.595	46.770
Wyoming	68.228	60.938	61.247	53.579	52.364

TABLE A.17

FINAL SHRINKAGE ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	70.332	62.418	66.999	61.664	62.850
Alaska	71.521	77.314	77.744	82.612	80.238
Arizona	74.673	62.887	59.273	55.820	47.116
Arkansas	64.628	51.692	59.763	53.914	64.175
California	57.738	60.597	60.738	61.728	54.392
Colorado	69.984	62.326	59.329	55.705	52.239
Connecticut	66.616	71.995	61.005	61.114	59.840
Delaware	73.918	72.563	66.864	68.439	55.757
District of Columbia	64.686	70.809	66.527	82.813	88.774
Florida	66.560	60.154	59.871	56.480	53.730
Georgia	75.315	72.050	65.046	58.378	57.499
Hawaii	83.586	100.000	89.312	100.000	100.000
Idaho	57.054	55.325	57.655	50.554	48.888
Illinois	72.529	75.295	68.857	73.901	66.293
Indiana	73.854	72.002	68.241	64.923	61.284
Iowa	71.736	68.230	64.016	64.260	56.932
Kansas	64.072	65.099	62.726	59.101	52.989
Kentucky	76.105	77.033	71.765	70.731	69.256
Louisiana	76.484	69.506	69.096	67.301	68.683
Maine	88.510	91.256	83.557	84.772	82.419
Maryland	71.604	75.601	67.297	68.345	66.341
Massachusetts	66.775	62.850	60.733	49.228	49.439
Michigan	78.000	79.817	73.066	74.286	70.310
Minnesota	68.916	70.435	66.076	58.812	55.617
Mississippi	80.701	71.610	73.357	68.092	56.813
Missouri	82.984	80.166	73.494	66.105	65.684
Montana	66.949	56.218	55.026	62.289	58.715
Nebraska	71.573	64.940	59.909	67.964	64.950
Nevada	58.476	57.425	56.891	47.466	45.513
New Hampshire	66.544	71.212	64.168	52.701	45.125
New Jersey	65.733	74.577	64.934	60.140	57.614
New Mexico	71.962	62.643	62.261	64.156	65.955
New York	73.249	73.886	68.200	65.496	59.702
North Carolina	62.908	60.912	65.177	57.923	50.403
North Dakota	63.404	59.346	59.766	60.497	54.427
Ohio	79.735	80.424	69.245	69.516	58.268
Oklahoma	68.163	63.483	58.361	82.445	61.249
Oregon	70.199	73.493	66.181	69.999	62.678
Pennsylvania	80.618	82.313	74.393	74.385	68.803
Rhode Island	77.007	81.504	73.970	68.114	69.674
South Carolina	68.749	53.880	63.941	63.221	63.638
South Dakota	58.760	51.215	55.947	57.776	57.339
Tennessee	83.363	74.643	69.928	69.116	69.381
Texas	71.695	71.425	63.775	56.515	50.680
Utah	74.627	73.436	71.841	64.614	59.928
Vermont	88.305	88.387	76.938	83.662	67.927
Virginia	74.613	72.916	65.555	57.279	58.779
Washington	73.797	78.638	70.861	67.994	63.590
West Virginia	91.440	93.808	88.839	99.649	92.208
Wisconsin	67.933	66.413	59.540	53.680	48.561
Wyoming	68.923	62.510	62.653	55.745	54.369

TABLE A.18

STANDARD ERRORS OF FINAL SHRINKAGE ESTIMATES OF PARTICIPATION RATES

	1994	1995	1996	1997	1998
Alabama	4.090	3.773	4.583	4.084	4.408
Alaska	5.496	5.272	5.494	5.884	5.635
Arizona	3.997	3.735	3.800	2.911	3.070
Arkansas	3.282	4.135	3.478	2.885	3.681
California	1.372	2.799	3.027	1.914	2.461
Colorado	4.869	5.492	4.601	5.402	5.214
Connecticut	5.035	5.256	4.678	5.579	5.115
Delaware	5.075	4.870	5.145	4.991	4.191
District of Columbia	6.048	4.546	4.108	6.174	7.066
Florida	3.634	2.603	2.916	2.014	1.959
Georgia	3.471	3.522	3.569	4.125	3.986
Hawaii	5.725	6.456	6.550	6.632	6.190
Idaho	4.007	3.464	4.177	3.847	4.822
Illinois	3.454	3.647	3.275	3.460	4.003
Indiana	4.222	3.772	4.291	4.553	4.023
Iowa	4.914	5.043	4.628	5.225	4.285
Kansas	3.424	4.072	4.725	4.776	4.543
Kentucky	4.396	4.615	4.551	4.092	4.545
Louisiana	4.140	4.884	5.044	4.816	4.322
Maine	4.867	5.508	5.361	5.444	5.227
Maryland	4.370	4.331	3.648	4.692	4.575
Massachusetts	3.665	4.796	2.406	3.887	3.943
Michigan	3.116	4.036	3.737	4.275	3.931
Minnesota	4.558	4.622	4.999	5.018	5.081
Mississippi	4.958	4.609	5.592	5.727	4.589
Missouri	5.811	6.330	5.717	5.174	5.670
Montana	4.673	4.829	3.660	4.109	4.528
Nebraska	4.794	5.173	4.356	4.696	4.657
Nevada	4.117	4.164	4.530	3.055	3.802
New Hampshire	4.378	4.845	4.919	4.486	4.054
New Jersey	3.448	4.256	3.680	4.056	4.304
New Mexico	2.703	3.697	3.373	4.588	5.159
New York	2.656	2.940	3.039	2.491	2.707
North Carolina	2.973	4.040	2.396	3.345	2.785
North Dakota	4.086	4.909	5.430	5.003	4.735
Ohio	3.331	3.587	2.611	3.058	3.471
Oklahoma	3.364	4.033	2.747	4.596	4.063
Oregon	4.138	4.169	4.021	3.355	3.862
Pennsylvania	3.465	3.984	3.653	3.447	3.941
Rhode Island	4.879	4.983	4.813	4.088	4.777
South Carolina	4.223	3.834	4.141	3.096	3.144
South Dakota	5.363	5.270	5.438	4.877	5.299
Tennessee	3.602	3.876	4.015	4.049	4.375
Texas	2.131	2.129	2.506	1.470	2.190
Utah	5.311	5.744	4.661	5.238	5.012
Vermont	5.175	5.095	4.094	5.028	4.550
Virginia	3.061	4.235	3.771	3.282	3.877
Washington	3.296	4.365	3.446	4.253	3.733
West Virginia	4.502	3.245	4.601	5.967	5.429
Wisconsin	4.405	3.939	4.458	4.783	4.818
Wyoming	4.515	4.221	4.103	4.762	5.072

TABLE A.19

FINAL SHRINKAGE ESTIMATES OF NUMBERS OF PEOPLE ELIGIBLE FOR FOOD STAMPS

	1994	1995	1996	1997	1998
Alabama	739,655	786,083	729,282	691,149	639,701
Alaska	62,038	57,181	59,830	50,373	51,411
Arizona	642,534	659,257	688,138	579,078	563,272
Arkansas	416,800	505,828	450,151	470,029	389,983
California	5,318,055	5,099,917	4,879,194	3,853,471	3,794,621
Colorado	359,611	377,807	383,105	344,380	336,902
Connecticut	327,775	306,911	348,215	331,342	302,224
Delaware	75,931	73,185	85,147	68,565	70,807
District of Columbia	139,798	131,111	135,881	105,827	93,198
Florida	2,088,091	2,220,929	2,170,700	1,797,398	1,703,246
Georgia	1,079,981	1,091,992	1,145,095	1,069,479	1,005,998
Hawaii	140,376	126,815	146,146	121,386	120,717
Idaho	127,880	134,966	125,758	120,504	108,535
Illinois	1,580,342	1,456,563	1,520,126	1,279,086	1,263,496
Indiana	635,861	522,491	523,118	499,170	481,875
Iowa	253,662	254,351	260,026	226,548	216,247
Kansas	284,431	268,265	255,166	216,138	209,783
Kentucky	666,484	657,791	644,617	583,498	563,928
Louisiana	957,156	971,193	906,513	790,882	756,021
Maine	145,454	136,774	149,555	132,987	127,897
Maryland	536,309	491,177	519,706	483,159	437,301
Massachusetts	639,679	614,457	592,542	608,046	543,293
Michigan	1,258,234	1,158,380	1,187,059	1,033,573	995,218
Minnesota	435,173	419,436	411,509	387,804	369,510
Mississippi	586,255	626,289	567,788	522,235	527,977
Missouri	679,480	667,004	698,445	613,494	595,484
Montana	99,663	118,293	117,764	96,174	98,601
Nebraska	143,374	149,819	158,972	133,585	140,314
Nevada	159,429	167,196	155,604	152,079	139,069
New Hampshire	84,637	72,436	74,119	75,002	75,452
New Jersey	817,903	701,431	784,335	726,088	677,562
New Mexico	316,749	363,563	357,150	274,009	260,362
New York	2,910,154	2,860,540	2,962,044	2,583,965	2,513,287
North Carolina	958,332	983,593	919,831	932,731	966,391
North Dakota	64,176	63,972	62,516	53,841	59,447
Ohio	1,451,923	1,299,057	1,324,091	1,135,165	1,136,524
Oklahoma	535,039	556,055	557,504	468,797	450,743
Oregon	379,478	367,750	390,327	309,971	327,733
Pennsylvania	1,428,773	1,357,613	1,385,928	1,257,725	1,200,991
Rhode Island	118,909	110,708	116,353	114,472	102,495
South Carolina	537,017	638,003	549,482	524,573	494,974
South Dakota	85,032	94,988	85,493	77,228	75,362
Tennessee	852,594	826,683	877,424	773,981	733,167
Texas	3,547,940	3,438,418	3,425,891	3,118,745	2,892,394
Utah	160,688	148,774	141,017	143,182	144,937
Vermont	70,861	62,695	66,980	56,976	52,093
Virginia	684,506	707,861	758,298	721,635	618,926
Washington	610,092	568,207	598,107	493,529	483,780
West Virginia	318,082	305,219	316,777	268,024	264,459
Wisconsin	478,006	451,408	419,190	377,852	366,619
Wyoming	46,646	48,952	50,630	43,267	41,921

TABLE A.20

STANDARD ERRORS OF FINAL SHRINKAGE ESTIMATES OF NUMBERS OF PEOPLE ELIGIBLE FOR FOOD STAMPS

	1994	1995	1996	1997	1998
Alabama	43,018	47,527	49,881	45,786	44,875
Alaska	4,767	3,900	4,228	3,588	3,612
Arizona	34,394	39,163	44,117	30,207	36,711
Arkansas	21,169	40,473	26,200	25,156	22,373
California	126,397	235,617	243,110	119,489	171,774
Colorado	25,020	33,298	29,710	33,401	33,642
Connecticut	24,775	22,409	26,703	30,253	25,842
Delaware	5,213	4,913	6,552	5,000	5,324
District of Columbia	13,072	8,420	8,390	7,890	7,420
Florida	114,009	96,155	105,753	64,117	62,112
Georgia	49,777	53,401	62,821	75,586	69,769
Hawaii	9,614	7,723	10,717	7,726	6,900
Idaho	8,983	8,452	9,109	9,172	10,708
Illinois	75,259	70,546	72,317	59,903	76,308
Indiana	36,344	27,374	32,898	35,008	31,644
Iowa	17,374	18,802	18,795	18,423	16,282
Kansas	15,198	16,785	19,222	17,469	17,989
Kentucky	38,505	39,413	40,882	33,763	37,019
Louisiana	51,804	68,257	66,173	56,600	47,588
Maine	7,998	8,257	9,596	8,542	8,113
Maryland	32,732	28,139	28,169	33,173	30,165
Massachusetts	35,109	46,897	23,477	48,020	43,344
Michigan	50,272	58,593	60,702	59,486	55,668
Minnesota	28,785	27,527	31,135	33,090	33,768
Mississippi	36,020	40,311	43,283	43,931	42,660
Missouri	47,577	52,680	54,328	48,022	51,416
Montana	6,957	10,163	7,833	6,347	7,606
Nebraska	9,604	11,936	11,557	9,231	10,064
Nevada	11,223	12,125	12,391	9,789	11,619
New Hampshire	5,569	4,929	5,682	6,385	6,781
New Jersey	42,904	40,036	44,456	48,979	50,629
New Mexico	11,901	21,458	19,349	19,596	20,374
New York	105,519	113,824	131,984	98,286	113,992
North Carolina	45,286	65,257	33,812	53,875	53,419
North Dakota	4,136	5,293	5,679	4,453	5,173
Ohio	60,650	57,959	49,935	49,943	67,736
Oklahoma	26,408	35,331	26,237	26,140	29,909
Oregon	22,366	20,863	23,717	14,860	20,197
Pennsylvania	61,406	65,722	68,046	58,292	68,800
Rhode Island	7,534	6,770	7,571	6,870	7,031
South Carolina	32,982	45,406	35,582	25,697	24,460
South Dakota	7,762	9,777	8,309	6,520	6,967
Tennessee	36,847	42,945	50,374	45,353	46,243
Texas	105,435	102,545	134,651	81,127	125,057
Utah	11,434	11,640	9,149	11,609	12,124
Vermont	4,153	3,615	3,564	3,425	3,491
Virginia	28,085	41,126	43,631	41,363	40,835
Washington	27,251	31,544	29,088	30,877	28,405
West Virginia	15,662	10,561	16,408	16,051	15,575
Wisconsin	30,997	26,780	31,386	33,673	36,382
Wyoming	3,055	3,306	3,315	3,697	3,912

TABLE A.21

NUMBER OF PEOPLE RECEIVING FOOD STAMPS IN SEPTEMBER, ADJUSTED FOR ISSUANCE ERRORS

	1994	1995	1996	1997	1998
Alabama	520,216	490,655	488,612	426,190	402,051
Alaska	44,370	44,209	46,514	41,614	41,251
Arizona	479,798	414,588	407,881	323,241	265,394
Arkansas	269,369	261,475	269,022	253,410	250,270
California	3,070,517	3,090,411	2,963,520	2,378,685	2,063,981
Colorado	251,670	235,472	227,294	191,837	175,993
Connecticut	218,350	220,961	212,428	202,496	180,850
Delaware	56,127	53,105	56,933	46,925	39,480
District of Columbia	90,430	92,839	90,398	87,638	82,736
Florida	1,389,825	1,335,967	1,299,609	1,015,166	915,147
Georgia	813,389	786,783	744,838	624,345	578,437
Hawaii	117,334	126,815	130,526	121,386	120,717
Idaho	72,961	74,670	72,506	60,920	53,061
Illinois	1,146,203	1,096,713	1,046,710	945,261	837,607
Indiana	469,611	376,203	356,983	324,077	295,310
Iowa	181,967	173,544	166,457	145,579	123,113
Kansas	182,241	174,638	160,055	127,739	111,162
Kentucky	507,226	506,713	462,609	412,715	390,554
Louisiana	732,073	675,034	626,365	532,275	519,256
Maine	128,742	124,815	124,963	112,736	105,411
Maryland	384,018	371,336	349,744	330,216	290,111
Massachusetts	427,146	386,185	359,869	299,327	268,597
Michigan	981,421	924,586	867,337	767,802	699,736
Minnesota	299,905	295,430	271,909	228,077	205,509
Mississippi	473,115	448,485	416,514	355,600	299,961
Missouri	563,858	534,708	513,314	405,553	391,140
Montana	66,723	66,502	64,801	59,906	57,894
Nebraska	102,617	97,292	95,239	90,790	91,134
Nevada	93,227	96,012	88,524	72,186	63,294
New Hampshire	56,321	51,583	47,561	39,527	34,048
New Jersey	537,636	523,104	509,302	436,672	390,371
New Mexico	227,939	227,745	222,366	175,794	171,723
New York	2,131,647	2,113,542	2,020,117	1,692,390	1,500,483
North Carolina	602,863	599,124	599,518	540,264	487,093
North Dakota	40,690	37,965	37,363	32,572	32,355
Ohio	1,157,685	1,044,756	916,863	789,117	662,234
Oklahoma	364,697	352,999	325,367	386,499	276,077
Oregon	266,391	270,272	258,324	216,977	205,416
Pennsylvania	1,151,854	1,117,492	1,031,038	935,554	826,320
Rhode Island	91,568	90,232	86,066	77,972	71,412
South Carolina	369,194	343,756	351,347	331,638	314,993
South Dakota	49,965	48,648	47,831	44,619	43,212
Tennessee	710,750	617,061	613,569	534,943	508,675
Texas	2,543,692	2,455,899	2,184,858	1,762,567	1,465,851
Utah	119,917	109,253	101,308	92,516	86,858
Vermont	62,574	55,414	51,533	47,667	35,385
Virginia	510,732	516,147	497,104	413,348	363,798
Washington	450,232	446,827	423,823	335,572	307,638
West Virginia	290,855	286,319	281,422	267,082	243,852
Wisconsin	324,722	299,794	249,584	202,830	178,033
Wyoming	32,150	30,600	31,721	24,119	22,792